Do Environmental Factors Predict Changes To Physical Activity And Sedentary Behaviour Equally?

Purpose

To investigate environmental determinants of change to sedentary behaviour (SB), light-intensity physical activity (LPA) and moderate-to-vigorous intensity physical activity (MVPA) in those at risk of diabetes.

Methods

Cohort of 808 adults recruited from family practice (age ~ 63 years, BMI ~ 32 kg/m², women ~ 36%) followed up annually over 3 years. Participants were included based on being above the 90th percentile of the Leicester Diabetes Risk Score, indicating a high risk. SB, LPA and MVPA were measured by accelerometer (Actigraph GT3X) using the Freedson cut-points with at least 4 valid days of data. Geographical and air pollution mapping were used to link environmental data to participant’s home address. Data were analysed using a repeated measures design assessing determinants of change to SB, LPA and MVPA. Results are presented as mean (SD) or mean (95% CI). Adjusted for age, sex and ethnicity. Bold indicates significance (p < 0.05)

Results

At baseline, accelerometers were worn for an average of 649 (83) minutes/day, during which an average of 27 (25) minutes/day, 288 (77) minutes/day and 543 (100) minutes/day were spent in MVPA, LPA and SB respectively. Across the study period, wear time did not change, whilst SB increased by 9 (7, 10) minutes/day per year, matched by a decrease in LPA and MVPA of 7 (5, 8) and 2 (1, 2) minutes/day per year respectively. Less green space, higher road connectivity (busier traffic), greater air pollution and pollution concentrations with prevailing outdoor nitrogen dioxide and particulate matter concentrations with 800mx 800m area. NO₂, PM2.5 and PM10(µg/m³) significantly lower in students who did not walk to campus at least once a week. Students that had access to a bus pass showed lower amounts of MPA, METS, and ST, while those who walked ≥ 15 minutes per week had significantly lower levels of weekly MPA (p = .024), METS (p = .021), and ST (p = .002). Weekly MPA, METS, and ST (p = .05) were also significantly lower in students who did not walk to campus at least once a week. Students that had access to a bus pass showed lower amounts of MPA, METS, and ST per week (p = .05). Students who did not walk once a week to campus and those who lived ≥ 15 minutes away from campus had significantly higher accessibility to exercise facilities/equipment at their home (e.g. treadmill, pool, etc.). These groups were also significantly lower in students who did not walk to campus at least once a week.

Conclusion

In this high risk population, a less healthy environment predicted greater annual decreases in SB and LPA and increases in MVPA in those at risk of diabetes.

Table 1: Association between environmental factors and annual change to SB, LPA and MVPA

<table>
<thead>
<tr>
<th>Environmental determinant</th>
<th>Change in sedentary time (minutes/day per year) for a given unit difference in the corresponding environmental factor (minutes/day)</th>
<th>Change in light-intensity physical activity (minutes/day per year) for a given unit difference in the corresponding environmental factor (minutes/day)</th>
<th>Change in moderate-to-vigorous physical activity (minutes/day per year) for a given unit difference in the corresponding environmental factor (minutes/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greenspace (% within 800m radius)</td>
<td>-2.34 (-4.30 to -0.38)</td>
<td>2.00 (0.26 to 3.74)</td>
<td>0.32 (-0.22 to 0.86)</td>
</tr>
<tr>
<td>Road density (km of road within 800m radius)</td>
<td>0.96 (-0.35 to 2.26)</td>
<td>-0.78 (-1.95 to 0.38)</td>
<td>-0.16 (-0.52 to 0.20)</td>
</tr>
<tr>
<td>Footpath density (km of footpath within 800m radius)</td>
<td>1.06 (-4.85 to 6.96)</td>
<td>-0.97 (-6.22 to 4.28)</td>
<td>-0.06 (-1.68 to 1.56)</td>
</tr>
<tr>
<td>Intersections that are connected (% within 800m radius)</td>
<td>6.41 (1.19 to 11.64)</td>
<td>-6.43 (-11.07 to -1.79)</td>
<td>-0.045 (-1.39 to 1.48)</td>
</tr>
<tr>
<td>Air pollution (prevaling outdoor nitrogen dioxide and particulate matter concentrations with 800mx 800m area. NO₂, PM2.5 and PM10(µg/m³)</td>
<td>1.42 (0.34 to 2.50)</td>
<td>-1.25 (-2.20 to -0.29)</td>
<td>-0.16 (-0.46 to 0.14)</td>
</tr>
<tr>
<td>Fast Food (restaurants within 1km radius)</td>
<td>1.09 (0.38 to 1.80)</td>
<td>-1.00 (-1.63 to -0.47)</td>
<td>-0.09 (-0.28 to 0.11)</td>
</tr>
<tr>
<td>Social deprivation (index of multiple deprivation score)</td>
<td>0.04 (-0.09, 0.18)</td>
<td>-0.06 (-0.19, 0.07)</td>
<td>0.02 (-0.02, 0.06)</td>
</tr>
</tbody>
</table>

Data as mean (95% CI). Adjusted for age, sex and ethnicity. Bold indicates significance (p < 0.05)
boarding a potential moderator between built environment and walking in older adults.

**CONCLUSIONS**

150 min of walking in a week (OR=1.55, 95% CI=1.10-2.19). However, no significant

age-related differences in associations of built environmental attributes with walking in older Taiwanese adults. METHODS: This study was based on a cross-sectional telephone survey using a computer-assisted telephone interviewing, targeting 1,068 older Taiwanese adults (over 65 years) in 2017. Time spent in walking was measured by the short version of the International Physical Activity Questionnaire. Built environmental attributes were assessed by geographic information systems (GIS), including population density, street connectivity, sidewalk availability, leisure destinations, utilization destinations & access to public transportation. Adjusted binary logistic regression models adjusting for potential confounders were employed to examine the relationships between the seven built environment variables & walking time in total sample, and stratified for young (65-74 year) & old (75+ years) adults. RESULTS: A total of 1,040 respondents provided complete information for analysis. The mean age (SD) of the respondent was 73.04 (± 6.13) years. 68.8% achieved 150 min of walking in a week. In total sample, only one GIS-derived environmental attribute - leisure destinations was positive associated with the 150 min of walking in a week (odds ratio (OR)=1.34, 95% confidential interval (CI)=1.02-1.75). After stratifying by age groups, among 65 to 74 age group, population density was negative associated with the 150 min of walking in a week (OR=0.65, 95%CI=0.46-0.93) and number of leisure destination was positive associated with the 150 min of walking in a week (OR=1.55, 95%CI=1.10-2.19). However, no significant associations were observed between all environmental attributes and walking in old adults who aged over 75 years. CONCLUSIONS: These results showed that age could be a potential moderator between built environment and walking in older adult population. High-density neighborhoods with favorable leisure destinations can be supportive for walking among young old adults (65-74 year). However, for old old adults (over 75 years), it is critical to further explore other multi-level factors related to their walking behavior.

**Physical Fitness And Neighborhood Design - Walkability, Cardiorespiratory Fitness, Muscular Strength, And Flexibility In Adults**


Email: gmccorma@ucalgary.ca

Regular physical activity can improve physical fitness levels and promote health. Consistent evidence suggests an association between the neighborhood built environment and physical activity exists, yet few studies have investigated the contribution of the neighborhood built environment to fitness levels in adults.

**PURPOSE:** To understand how park users acquire MVPA across a variety of park features within the City of Knoxville, a mid-sized city in the Appalachian region. METHODS: Physical activity, both active and passive, was assessed at 12 parks equally distributed across the City of Knoxville Parks and Recreation Planning sectors. The System for Observing Play and Recreation in Communities (SOPARC) was used to directly observe activity over two weeks, a week in October 2018 and a week in March 2019. Observations covered 4 days of the week at three different time points. Across all parks, 42 scan zones were identified and categorized into 6 physical activity zones (athletic field, athletic court, playground, open space, pavilion + athletic field, and pavilion + open space). Demographic profiles of users, their observed physical activity types, and average MET-intensity across zones were calculated. SPSS (version 25) was used to contrast observations.

**RESULTS:** In total, 1,548 activity zone scans observed 3,961 residents using the parks. Users were predominately male (53.8%), adult (55.2%), and white (66.5%). During the scans, 70.5% of the zones were empty. In zones with users (N=477), the most commonly observed primary activity was walking (25.1%). The activity zones with the lowest level of users were athletic fields (13.5%), open spaces (16.1%), and athletic courts (17.3%). Playgrounds (32.2%) had the highest level of use. Related to intensity, zones with moderate or above intensity levels included: athletic fields (3.9 METs), athletic courts (3.8 METs), and playgrounds (3.16 METs). CONCLUSIONS: Park features with the greatest potential for MVPA (athletic courts/fields) attract the fewest number of park users. As recreation and public health officials strive to attract more users who are physically active when they visit a park, they should consider other features, especially those that promote walking.

**Effects Of Home Environment On Physical Activities With Different Intensity In High School Students**

Xiao HOU, Jing-min LIU, Zheng-Yan TANG, Yu-Jie LIU. Tsinghua University, Beijing, China.

Email: houxiao18@hotmail.com

Except school, home is the second largest place for students to encounter their daily lives, so physical and social environment of the family can contribute either positively or negatively to lifestyle behaviors of students. PURPOSE: This paper will quantitatively study the influence of different intensity (Sedentary Behavior, Light intensity, Moderate and Vigorous intensity) activities (PA) of high school students. METHODS: We conducted the research on 314 Chinese high school students and their parents. The home environment survey includes 39 items divided into four scales (PA availability, PA accessibility, Parental role modelling of PA, Parental policies to support PA). The PA of students divided into three different intensity (Sedentary Behavior, Light intensity, Moderate and Vigorous intensity) were measured by Actigraph GT3X+ device. The data was analyzed using the multiple linear regression. RESULTS: A one standard deviation (SD) increase in PA accessibility, mother role modelling of PA, mother policies to support PA was associated with a reduction in SB (minutes/week) by 65.44 (p < 0.05), 116.87 (p < 0.01) and 175.42 (p < 0.01) respectively. A one SD increase in PA accessibility, mother policies to support PA was associated with an increase in LPA (minutes/week) by 12.65 (p < 0.01) and 16.91 (p < 0.01) respectively; an increase MVPA (minutes/week) by 81.11 (p < 0.01) and 52.21 (p < 0.05) respectively. CONCLUSIONS: With the development of PA accessibility, the modeling and supportive policies of mother, the PA of high school students can be reduced significantly. And the PA accessibility and supportive policies of mother can evidently improve students’ LPA and MVPA.
The physical and built environments are related to physical activity (PA) in adults and the relationship seems apparent in children. Child PA behavior often depends on parents in a variety of ways including involvement, facilitation, or role modeling. The home environment is one setting in which these relationships may be further examined.

**PURPOSE:** To examine facets of the home environment and parent perceptions of neighborhood safety may be associated with child total PA and moderate-to-vigorous (MVPA) levels in a rural sample.

**METHODS:** Baseline data were analyzed from NU-HOME, a childhood obesity prevention, randomized controlled trial in rural communities. 105 children (age=8.96±1.06 yrs) and their parents (age=37.91±5.42 yrs) reported on sociodemographics and home/neighborhood environments. Child daily PA (total and MVPA) was measured using accelerometers and, using SAS 9.4, associations were examined with home/neighborhood environment variables through multivariate regression models, both unadjusted and adjusted for economic assistance. Normality was not met for child daily MVPA therefore analyses used the log-transformed variable.

**RESULTS:** Mean child total PA was 259.08±58.22 min/day and MVPA was 44.95±18.58 min/day. In unadjusted analyses, access to PA equipment in the home (p<0.037) and neighborhood safety (p<0.049) were associated with total PA; however, no factors were statistically significantly associated with MVPA, although access to PA equipment (p=0.008) and family support for PA (p=0.062) were trending towards significance. For both total PA and MVPA outcomes, the regression models including all variables and accounting for economic assistance were statistically significant (p<0.026 and p<0.034, respectively). For each model, the individual effects of parent PA and PA equipment were statistically significant (p ranges from 0.008 to 0.037).

**CONCLUSIONS:** This study highlights the potential of the home/neighborhood environment as a space for interventions to increase PA in rural children. Only 14% of children in this rural sample met PA recommendations, so interventions to increase PA, particularly MVPA, are needed. Future studies should include multiple levels of a rural child’s environment (i.e., school, town) to examine which may play the largest role in PA.

**Table 1. Characteristics of sample**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total</th>
<th>Male</th>
<th>Female</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>314</td>
<td>178</td>
<td>136</td>
<td>14-19</td>
</tr>
<tr>
<td>Characteristics, mean (SD)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (yr)</td>
<td>15.70±0.62</td>
<td>16.08±0.47</td>
<td>15.38±0.54</td>
<td>14-19</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>165.87±(6.0)</td>
<td>175.92±(8.2)</td>
<td>162.18±(1.3)</td>
<td>155-183</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>62.63±(12.72)</td>
<td>70.10±(13.38)</td>
<td>59.79±(12.4)</td>
<td>63-140.1</td>
</tr>
<tr>
<td>MVPA (sedentary)</td>
<td>17.49±(13)</td>
<td>21.56±(18)</td>
<td>13.40±(12.5)</td>
<td>12-23</td>
</tr>
<tr>
<td>MVPA (moderate)</td>
<td>21.56±(18)</td>
<td>26.17±(23)</td>
<td>16.96±(18)</td>
<td>18-25</td>
</tr>
<tr>
<td>MVPA (vigorous)</td>
<td>26.17±(23)</td>
<td>31.00±(28)</td>
<td>19.00±(24)</td>
<td>20-30</td>
</tr>
</tbody>
</table>

**Table 2. The relationship between home environment and different physical activity of sample**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Male only</th>
<th>Female only</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA availability</td>
<td>-0.47</td>
<td>-0.62**</td>
<td>-0.47</td>
</tr>
<tr>
<td>PA accessibility</td>
<td>-0.32</td>
<td>-0.44**</td>
<td>-0.33</td>
</tr>
<tr>
<td>Parental role</td>
<td>-0.44</td>
<td>-0.58**</td>
<td>-0.45</td>
</tr>
<tr>
<td>Modelling of PA (father)</td>
<td>-0.61</td>
<td>-0.78**</td>
<td>-0.67</td>
</tr>
<tr>
<td>Parental role</td>
<td>-0.70**</td>
<td>-0.80**</td>
<td>-0.80</td>
</tr>
<tr>
<td>Modelling of PA (mother)</td>
<td>-0.18</td>
<td>-0.26**</td>
<td>-0.22</td>
</tr>
<tr>
<td>LPA availability</td>
<td>-0.40**</td>
<td>-0.46**</td>
<td>-0.42**</td>
</tr>
<tr>
<td>PA accessibility</td>
<td>-0.18</td>
<td>-0.27**</td>
<td>-0.21</td>
</tr>
<tr>
<td>Parental role</td>
<td>-0.70**</td>
<td>-0.78**</td>
<td>-0.74**</td>
</tr>
<tr>
<td>Modelling of PA (father)</td>
<td>-0.35</td>
<td>-0.44**</td>
<td>-0.40</td>
</tr>
<tr>
<td>Parental support</td>
<td>-0.40**</td>
<td>-0.46**</td>
<td>-0.40**</td>
</tr>
</tbody>
</table>

**Notes:** *p<0.05; **p<0.01.
the most active and least sedentary when at school, yet children only accumulated 17.5 minutes of MVPA in this environment. Thus, in-school and out-of-school interventions are needed to help children meet the daily recommended minutes of PA.

G-20 Thematic Poster - Physical Activity and Health Equity
Saturday, May 30, 2020, 9:00 AM - 11:00 AM
Room: CC-209

3627 May 30 9:00 AM - 11:00 AM
Chair: Michelle Martin, FACSM, University of Tennessee, Memphis, TN.

Influence Of Social Networks On Nutrition And Physical Function Of Ethnic Older Minorities Over Time
Evans A. Asamane, Carolyn A. Greig, Janice L. Thompson, FACSM. University of Birmingham, Birmingham, United Kingdom. (Sponsor: Janice L. Thompson, FACSM)
Email: asamaneevans@yahoo.com

BACKGROUND: Social networks (SN) are consistently shown to influence health outcomes in later life. However, relatively little is known about SN of ethnic older minorities, and how they impact on health outcomes over time. PURPOSE: To explore SN and their impact on nutritional intake and status, and physical function in ethnic older minorities (≥60 years) living in Birmingham, United Kingdom. METHODS: SN were assessed using the Wenger Practitioner Assessment of Network Types (PANT). Multiple-pass 24-hour dietary recalls and the Mini Nutritional Assessment-Short Form assessed nutritional intake and status, respectively. Short Physical Performance Battery (SPPB) and handgrip strength measured physical function. Correlation and regression analyses examined relationships between SN, physical performance, nutritional intake and physical function. The influences of SN were captured through semi-structured interviews at baseline (N=92) and follow-up (N=81). Interviews were transcribed verbatim and analysed using directed content analysis. RESULTS: Of the 100 participants measured at baseline, 81 were followed up 8 months later. Mean age =70.9±8.1 years (62% male) comprising African/Caribbean (65%), South Asian (28%), and other ethnicities (7%). Five SN were identified and grouped into two broad categories: integrated SN (locally integrated (44%) and wider community (8%)); and non-integrated SN (family dependent (25%), locally self-contained (17%), and private restricted (6%)). At follow-up, SN declined in 19% and improved in 11%. There was an overall decrease in physical function (F(1)=9.73, P<0.03) and nutritional status (F(1)=6.04, P=0.016) over time. Participants in integrated SN compared to non-integrated SN at baseline were less likely to experience a decline in physical function at follow-up (OR: 0.17; 95% CI:0.04-0.63). Qualitative results indicated that participants with declines in SN perceived this as causing poorer physical function and eating behaviors. CONCLUSION: Changes in SN occurred over a relatively brief period in this sample, with integrated SN associated with better physical function, nutritional intake and status. These findings can inform interventions and community outreach programmes designed to enhance SN and the health status of these populations.

3628 Board #1 May 30 9:00 AM - 11:00 AM
Developing Smart Goals With Latinos To Address Their Life Concerns Surrounding Physical Activity And Recreation
Sharon E. Taverno Ross, Maria del Rosario Christophersen, Patricia I. Doknet, University of Pittsburgh, Pittsburgh, PA. (Sponsor: Andrea Kriska, FACSM)

PURPOSE: Raices was a community health worker (promotores)-delivered intervention offering non-directive social support to improve healthcare access, physical activity, and healthy eating among Latinos living in an emerging Latino community, an area with a small yet growing Latino population. The purpose of this study was to determine whether the intervention helped participants develop SMART (i.e., specific, measurable, realistic, attainable and time-bound) goals that addressed their life concerns, specifically highlighting those findings related to physical activity. METHODS: Promotores used an intervention tool assessing wellness in eight domains of participants’ lives (e.g., family, physical activity/recreation) and supported participants in developing SMART goals to address their life concerns. The research team summarized participants’ data and assessed whether the goals 1) met SMART criteria and 2) focused on participants’ identified concerns. RESULTS: We recruited 192 Latino participants from South America (42%), Mexico (30%) Central America (11%) and other countries (16%). Participants ranked physical activity and recreation (18.2%) and eating habits (17.8%) as top areas that were concerning or very concerning. Overall, participants developed 195 goals after the first intervention visit. Most goals met the SMART criteria completely (35.4%) or partially (48.7%). Of the 195 goals set, 30% of them focused on physical activity/recreation, and 91% of those goals met the SMART criteria completely or partially. CONCLUSIONS: Promotores successfully elicited participant life concerns and assisted them in setting SMART goals to address these areas of concern, including a top concern of physical activity/recreation. The intervention would benefit from additional promotores training in developing SMART goals.

3629 Board #2 May 30 9:00 AM - 11:00 AM
Acculturation And Leisure-time Physical Activity Among Asian American In The United States, 2011-2016
Xuanxuan Zhu, Jhong Liu, Maria Sevoyan, Russ R. Pate, FACSM. University Of South Carolina, Columbia, SC. (Sponsor: Russell R. Pate, FACSM)
Email: xzhu@email.sc.edu

The Asian population has become the fastest growing ethnic group in the United States (US). However, less than a quarter of Asian Americans met WHO Physical Activity (PA) Guideline. Few studies have examined the association between acculturation and leisure-time PA among Asian Americans.

PURPOSE: To examine the association between acculturation and leisure-time PA among Asian American adults.

METHODS: Data concerning 1,989 Asian Americans aged 20 years and older, came from the 2011- 2016 National Health and Nutrition Examination Survey (NHANES). Acculturation was assessed in three dimensions: the language preference at home (only Non-English language, both English and Non-English language, and only English), length of residency in the US (<10 years, 10-29 years, ≥30 years, US born), and

3630 Board #3 May 30 9:00 AM - 11:00 AM
Developing Smart Goals With Latinos To Address Their Life Concerns Surrounding Physical Activity And Recreation
Sharon E. Taverno Ross, Maria del Rosario Christophersen, Patricia I. Doknet, University of Pittsburgh, Pittsburgh, PA. (Sponsor: Andrea Kriska, FACSM)

PURPOSE: Raices was a community health worker (promotores)-delivered intervention offering non-directive social support to improve healthcare access, physical activity, and healthy eating among Latinos living in an emerging Latino community, an area with a small yet growing Latino population. The purpose of this study was to determine whether the intervention helped participants develop SMART (i.e., specific, measurable, realistic, attainable and time-bound) goals that addressed their life concerns, specifically highlighting those findings related to physical activity. METHODS: Promotores used an intervention tool assessing wellness in eight domains of participants’ lives (e.g., family, physical activity/recreation) and supported participants in developing SMART goals to address their life concerns. The research team summarized participants’ data and assessed whether the goals 1) met SMART criteria and 2) focused on participants’ identified concerns. RESULTS: We recruited 192 Latino participants from South America (42%), Mexico (30%) Central America (11%) and other countries (16%). Participants ranked physical activity and recreation (18.2%) and eating habits (17.8%) as top areas that were concerning or very concerning. Overall, participants developed 195 goals after the first intervention visit. Most goals met the SMART criteria completely (35.4%) or partially (48.7%). Of the 195 goals set, 30% of them focused on physical activity/recreation, and 91% of those goals met the SMART criteria completely or partially. CONCLUSIONS: Promotores successfully elicited participant life concerns and assisted them in setting SMART goals to address these areas of concern, including a top concern of physical activity/recreation. The intervention would benefit from additional promotores training in developing SMART goals.

3631 Board #4 May 30 9:00 AM - 11:00 AM
Aging Effects Of A 12-month Period On Cardiometabolic Risks In Older Adults
Kivana Keane1, Alexis Sides1, Austin Anderson1, Malli Fowler1, Sarah Ginger2, Shawn Hinson1, Evan L. Martin1, Benjamin Patterson1, Colleen Pecoraro1, Tommy Scott1, L. Jerome Brandon, FACSM2, Trudy Moore-Harrison1, UNC-Charlotte, Charlotte, NC. (Sponsor: L. Jerome Brandon, FACSM)
Email: kkeane5@unc.edu

PURPOSE: Aging is characterized by decreased functional ability and increased cardiometabolic (CMO) risks. Being physically active is believed to slow these diminishing characteristics in older adults. Therefore, the purpose of this study was to determine if CMO values would decline following a 12-month period in active older adults.

METHODS: The participants were 148 active older adults from the metropolitan area of a southern city. Activity ranged from participating in structured fitness classes
to participating in limited physical activity. Overall, the community was active. The participants were measured for CMO risks and morphological characteristics initially and 12 months later and two tests were statistically evaluated for differences.

**RESULTS:** The participants were obese based on body fat% (40%) and overweight based on body mass index (BMI - 29.1). Triglyceride (Trig = 150 mg/dL) on the posttest and systolic blood pressure (137 mmHg) on the pretest were the only variables that met risk classification based on metabolic syndrome risk criteria. High density lipoproteins (HDL) (59 to 62 mg/dL) improved on the posttest. Generally, there was a trend toward improvement for the other CMO variables. The percent different (%diff) between the variables for the two tests ranges from 0 for DBP to 13.6% for Trig. Trig had the largest %diff, but also had the largest variability between assessments and therefore, was not significant.

**CONCLUSIONS:** Data suggest that BMI categories remained stable in a physically active community of older adults during a 12-month period. Efforts should be made to keep older adults active as they age.

---

**Board #5 May 30 9:00 AM - 11:00 AM BMI Influence On Quality Of Life Following Physical Activity Program For Women In Homeless Shelters**

Lori A. Thomas, Lebanon Valley College, Annville, PA.

(No relevant relationships reported)

**BMI Influence On Quality Of Life Following Physical Activity Program For Women In Homeless Shelters**

Lori A. Thomas, Jenna M. Marx, McKenna Lupold, Abigail Kinneman, Hayley McClory, Tonya Y. Miller. Lebanon Valley College, Annville, PA.

**PURPOSE:** Examines if BMI category was associated with the outcomes of a 4-week physical activity educational program on the quality of life and physical fitness of nine women who were homeless and residing in urban environment shelters. **METHODS:** The educational program, Be Active Your Way, intervention incorporated educational sessions one time a week for four weeks led by student investigators. Researchers measured the programs’ effectiveness with pre- and post-program assessment using the Healthy Days Core Module, Two Minute Walk Test (2MWT), Perceived Stress Scale (PSS), and the Acceptance and Action Questionnaire (AAQ-II). **RESULTS:** Women who were overweight and residing in homeless shelters showed a trend on the AAQ-II in the decreased number of days their health affected activity, but the trend was not significant (pre=7.6 days, post=4 days); p<.05. Women who were Class II obese residing in homeless shelters showed a decreased trend in their psychological inflexibility score, but the trend was not significant (pre=29.5, post =20.5); p>0.05. There were no significant statistics or other noticeable trends among BMI classification data in relation to PSS or 2MWT. **CONCLUSION:** Findings from this study showed that BMI category did not contribute significantly to health-related quality of life outcomes following a physical activity program among women residing in a homeless shelter. Women residing in a homeless shelter may find an educational physical activity program beneficial, regardless of BMI category.

---

**Board #6 May 30 9:00 AM - 11:00 AM Identifying Disparities in Youth Healthcare Access Post-Sport Related Concussion and Post Concussion Syndrome**


Email: grejea@shands.ufl.edu

(No relevant relationships reported)

Disparities in healthcare may occur when availability, accessibility, and quality of healthcare services differ. These factors influence health, resulting in differences in morbidity and mortality. Among injuries, concussion and post-concussion syndrome may lead to significant long-term impairments in up to 40% of youth, with a greater number of impairments seen in minority populations. During recruitment for a previous study, lack of population diversity prompted an exploration of our patient population. **PURPOSE:** The purpose of the study was to explore differences in race, ethnicity, and sex among youth and young adults who sought care for concussion or post-concussion symptoms within a large academic medical center to determine whether differences exist among sub-groups. **METHODS:** Utilizing an Integrated Data Repository, c2b2, a query was performed to determine the number of individuals ages 10 to 34 years of age who sought care for concussion or PCS between 9/2015 and 6/2019 within a large academic health system. Over 3,270 youth, adolescents, and young adults (YAYA) sought healthcare and received a concussion or PCS diagnosis. **RESULTS:** Among recipients of concussion care, there were 2, 226 (68%) non-Hispanic White, 720 (22%) African American/Black (AA/BB), and 224 (7.0%) Other. Post-Concussion Syndrome diagnoses among 1,143 YAYA of whom 796 (70%) Caucasian, 210 (18%) AA/B, 17 (2%) Biracial, and 103 (9%) Other. While males had more overall concussion diagnoses (n=1,339, 60%), females had higher incidence of PCS (n=465, 55%). **CONCLUSIONS:** Comparison of these results with community demographic data reveals AA/B and Hispanic YAYA seeking concussion care may be underserved within the trauma system. Additionally, higher incidence of female PCS deserves further exploration to ascertain whether individual, initial management, or delays in connecting with the healthcare system may be factors in persistent symptomatology post-TBI. Additional research is needed to ascertain health system factors that may address and reduce future disparities in TBI care delivery and patient outcomes, including geocoding to ascertain the impact of YAYA residence and proximity to the trauma center.

---

**Board #7 May 30 9:00 AM - 11:00 AM Kids Fun, Food & Fitness: The Need For An Exercise And Nutrition Program For Children With ASD**

M Alysia Mastrangelo, FACSM1, Mary Kientz2, Joan Perks2, Gabriele Bandelli3, Carlo Burnup4, Kristin Cavorley2, Emily Dishrow2, Emily Sorochynskyj2, Stockton University, Shamong, NJ. Stockton University, Galloway, NJ.

Email: m.alyisia.mastrangelo@stockton.edu

(No relevant relationships reported)

**PURPOSE:** Nationally, in 159 children are diagnosed with an autism spectrum disorder (ASD) with NJ having the highest rates at 1 in 34 children. Children with ASD are more likely to experience health disparities that can impact quality of life. The disparities include an increase in type II diabetes, issues with food sensitivities, sensory processing impairments, and a decrease in time spent in moderate to vigorous physical activity (PA). The purpose of this study is to assess the need for a community/ family-based exercise and nutrition literacy program for children ages 8-15 y.o. with an ASD. **METHODS:** Participants (n=9) with an ASD diagnosis, ages 8-15 y.o. were assessed prior to initiation of the Kids: Exercise, Food and Fun program. The assessment included anthropometric measures, grip strength, plank, Stork test bilaterally, sit and reach and 6-minute walk. This study was approved by the Institutional Review Board for Human Subject at Stockton University. **RESULTS:** At baseline the mean age of participants was 12.1 y.o. with 6 boys and 3 girls. The average weight was 55.1 Kg, and height was 149.4 cm. BMI was determined and subjects were categorized by CDC classification; n=3, healthy, n=1, overweight and n=5, obese. Waist circumference measures determined the majority (n=5) were at or above the 80th percentile for risk. Mean fitness measures are as follows; right grip strength = 12.8 Kg, Stork test, right = 12.80 sec and left =10.09 sec, plank =10.31 sec and sit and reach =22.44 cm. The mean distance for the 6MW was 366.19m. **CONCLUSIONS:** These results indicate most participants were overweight or obese with an expected increased risk for comorbidities at baseline. Study participants demonstrated decreased grip strength, upper body strength and standing balance. They could benefit from an exercise and nutrition program with a parent or caregiver. The aim of the study will be to improve access to fitness activities and healthy food options. Sessions will consist of age appropriate PA and a cooking/nutrition class where participants will learn basic nutrition principles, food safety, and prepare a food to take home themselves. Post-assessment will evaluate body composition and fitness measures.

---

**Board #8 May 30 9:00 AM - 11:00 AM Are Physical Therapists’ Attitudes About Disability A Predictor Of Their Attitudes About Client-self-directed-mobility?**

William Kennedy1, Jafra D. Thomas2, Samuel W. Logan3.1Oregon State University, Corvallis, OR. 2California Polytechnic State University, San Luis Obispo, CA. (Sponsor: Bradley J. Cardinal, FACSM)

Email: kennedyw@oregonstate.edu

(No relevant relationships reported)

Physical therapists (PTs) are expected to play a key role in supporting individuals with disabilities to lead independent, active, and healthy lifestyles. However, limited knowledge exists about dispositional factors that could influence PTs’ motivation to provide healthcare that: (1) assist clients to overcome acute barriers to independent mobility; and (2) supports clients to lead active, healthy lifestyles across the lifespan. **PURPOSE:** This study determined if PTs’ attitudes about disability predicted their attitudes about client-self-directed mobility (i.e. independent mobility). **METHODS:** A convenience sample of 308 pediatric PTs were recruited from workshops held across 11 U.S. states between 2016 and 2017. Topics covered in the workshops included promoting and teaching ways to modify ride-on cars for young children with disabilities. Prior to their participation in the workshops, study participants completed two questionnaires: (1) the Attitudes Toward People with Disabilities Scale (ATDP; Cronbach α = .80); and (2) the Attitudes Towards Self-Directed Mobility Scale
participants held towards disability because of their occupational status as PTs and how they viewed disability (e.g., social model of disability). Future research is needed aimed at incorporating a broader range of predictors of attitudes about client-self-directed-mobility. Such work would add insight into PTs’ dispositional factors that could influence the quality and type of healthcare that they provide to individuals with disabilities.

Purpose: With the increase of academic pressure, students spend more time in sedentary behaviour. Long-term wrong sitting posture will bring many health problems. To investigate the prevalence of scoliosis among primary and secondary school students in Changzhou.

Methods: From May to July 2019, we measured the spine index of 10229 students (age: 10-13 years) from 7 primary and 3 middle schools in Changzhou City, including 5437 boys and 4708 girls, 84 of whom did not participate in the screening, and 10145 of whom were effectively screened. We screen scoliosis in three steps: 1: with examine back exposed and standing naturally, the examiner check if the shoulders are equal in height; whether lower scapular horn, bilateral lumar fovea is symmetrical; whether bilateral lumar ridge is equal; the above has an anomaly positive, can be defined as posture abnormality. 2: positive result of first test, carry out Adam test, if Adam bending test has the above signs, the spine is measured by the ruler. 3: the patients with suspected scoliosis were diagnosed as scoliosis by radiologist to take the full-length bending test has the above signs.

Results: In first step, 4585 cases of abnormal posture, the incidence of bad posture was about 45.2%, and the detection rate of high and low shouldered among the students was 35.2%, the detection rate of boys was 28.5%. The detection rate of female students was 38.8%. The incidence of pelvic rotation was 15.1% in boys and 17.9% in girls, and the incidence of lateral flexion in neck was 4% in boys and 9% in girls. The detection rate of scoliosis was 24.3%. Finally, some students carried out the third inspection, and the consistency between the third inspection and the second inspection reached 98%.

Conclusion: Through screening, it was found that the detection rate of abnormal posture was high. Therefore, the establishment of spine health records will help them pay attention to spine health. Supported by Social Science Foundation of Jiangsu Province(BE2018752),Science and Technology Support Plan of Changzhou (CE20195046).

Purpose: To evaluate state-level change in physical activity and sedentary behaviors of Michigan youth who receive locally relevant SNAP-Ed programming selected and implemented by community-based organizations. METHODS: Participants were youth (grades 4th-8th) receiving SNAP-Ed programming that included evidence-based interventions with a physical activity component. Youth received a physical activity questionnaire pre- and post-intervention. Participant data were matched based on demographic indicators, and data were aggregated at the state-level. Descriptive statistics were calculated for all variables of interest, and Wilcoxon Signed Rank tests were used to compare differences pre- and post-intervention for physical activity and sedentary behaviors (i.e. weekday hours spent watching TV). RESULTS: Participants included 1,399 youth (grades 4th-8th) from SNAP-Ed programming delivered through 15 different community organizations across Michigan. The majority of participants were Caucasian (65.0%) and non-Hispanic (86.5%), and approximately one-half were male (49.9%). A statistically significant increase was found for the number of days that youth self-reported being physically active for at least 60 minutes pre- and post-intervention (pre: 4.18±2.13; post: 4.43±2.05; p<0.001), and a statistically significant decrease was found for the number of hours youth reported watching TV on a weekday pre- and post-intervention (pre: 1.76±1.55; post: 1.66±1.49; p=0.012). CONCLUSIONS: Implementation of locally relevant SNAP-Ed programming selected by community organizations can positively impact physical activity and sedentary behaviors. Future research should explore commonalities amongst locally relevant programs to identify key implementation characteristics for greatest impact and progress toward equity.
learning opportunities into traditional educational practices may improve children’s PA profile. **Purpose**: The primary purpose of this study was to compare differences in Pre-Kindergarten children’s PA and SB between a nature-based or traditional classroom setting. **Methods**: 26 children from one Pre-K program enrolled in this study. Data was collected using waist-mounted accelerometers worn for 8 hours (2454min/day) across two separate weeks in the winter and spring. During each four-week day, participants spent two days in a traditional classroom setting, and two days in a nature-based setting. Accelerometer data was analyzed using Butte (2013) cutpoints. One- tailed paired t-tests were used to detect significant differences (p<0.05) in PA and SB between settings. **Results**: In a nature-based setting, significantly more time was spent in moderate- to vigorous-intensity PA during Unstructured (Diff: 8.0±9.9% of Wear Time [WT]; p<0.001) and Structured time (Diff: 1.4±2.9% WT; p<0.011). Significant less time was spent in SB during Unstructured (Diff: -3.1±1.7% WT; p<0.017) and Structured time (Diff: -2.2±0.3% WT; p<0.023) in a nature-based setting, however, significantly less time was spent during Structured (Diff: -2.9±3.6min; p<0.001) was allocated to Unstructured free play. There were no significant differences in the amount of time participants spent in Structured time (Diff: 1.4±7.9min; p=0.375) between class settings. **Conclusion**: Children engaged in significantly more PA and less SB while learning outdoors compared with indoor learning, despite less time being allocated to free play. Modifying educational practices to include outdoor education has the potential to increase the quantity of in-school PA children accumulate while simultaneously reducing SB.

### Board #5 May 30 9:00 AM - 11:00 AM

#### Comparative Discrimination Of Obesity By Muscular And Cardiorespiratory Fitness: A Receiver Operating Characteristics Curve Analysis.

Toin Ajisafe, Noe DeAnda.
Texas A&M University - Corpus Christi, Corpus Christi, TX.

Email: toin.ajisafe@tamu.edu

(No relevant relationships reported)

**Purpose**: Muscular and cardiorespiratory fitness are associated with adiposity and cardiovascular disease risk in youth. The degree to which these measures discriminate obesity is not lucid. This study investigated muscular and cardiorespiratory fitness capacities to discriminate obesity. **Methods**: Participants (N = 210; 116 males) (9.7 ± 1.08 years; 138.6 ± 9.4 cm; 42.3 ± 14.4 kg) (84% Hispanic/Latino) muscular and cardiorespiratory fitness were assessed using the 20-meter Progressive Aerobic Cardiovascular Endurance Run (PACER) and 90° push-up test, respectively, per FITNESSGRAM® protocols. Weight status was classified using CDC Growth Charts. Non-obesity was coded as “0” and obesity was coded as “1.” A Receiver Operating Characteristics (ROC) curve analysis was performed to identify the True Positive Rate (TPR) (i.e., Sensitivity) and False Positive Rate (FPR) (i.e., 1 - Specificity) using SPSS. The area under the curve (AUC) indicated the degree to which each fitness measure distinguished between the presence and absence of obesity. The measurement threshold with the greatest TPR-FPR distance was considered optimally discriminative. **Results**: Of the sample, 43% had obesity and 55% did not. PACER was fairly discriminative of obesity in girls (AUC = 0.748; P < 0.001; 95% CI [0.651, 0.845]) and boys (AUC = 0.755; P < 0.001; 95% CI [0.665, 0.845]). Significant more time was spent outside (Diff: 35min; p=0.001) in a nature-based setting, however, significantly less time (Diff: -2.9±3.6min; p<0.001) was allocated to Unstructured free play. There were no significant differences in the amount of time participants spent in Structured time (Diff: 1.4±7.9min; p=0.375) between class settings. **Conclusion**: Children engaged in significantly more PA and less SB while learning outdoors compared with indoor learning, despite less time being allocated to free play. Modifying educational practices to include outdoor education has the potential to increase the quantity of in-school PA children accumulate while simultaneously reducing SB.

### Board #6 May 30 9:00 AM - 11:00 AM

#### Impact Of Schoolyard Green Space And Hardscape Design On Play Behaviors Of Urban Children

Elena Daniel, NKese Jack, Marcella Raney, Occidental College, Los Angeles, CA.

(No relevant relationships reported)

Previous studies have shown that large-scale schoolyard greening projects increase physical activity (PA) participation. However, the relative impact of nature access and schoolyard design on free play behaviors is unknown. **Purpose**: To determine how green space and specific schoolyard design features impact individual and population-level PA and social behaviors during recess. **Methods**: Recess behaviors were recorded with the validated SOPLAY and SOCARP observation tools for one week at four urban Title 1 elementary schools (N = 2051): 1) 1.5% green space, 10 zones; 2) 0% green space, 8 zones; 28% green space, 10 zones; 4) 50% green space, 8 zones. Data was analyzed with linear mixed models and Pearson correlation at a significance level of 0.05. **Results**: Sedentary levels were higher for older students at locations with fewer play areas regardless of green space square footage (1st-3rd grade: 49.5±2.9%; 4th-6th grade: 59.7±3.1%) and lower for younger students in green space compared to asphalt schoolyards (52.8±1.8 vs. 47.4±1.7%) (p<0.001). More students were engaged in moderate-to-vigorous physical activity (MVPA) while playing tag (71.2±2.1%) or group/dodgeball (58.1±3.3%) in green space and on play structures compared to traditional playground games (e.g. handball, 4-square, tetherball) on asphalt (45.6±1.7%) (p<0.001). Students spent more time in small groups (10.8±0.7 vs. 9.3±0.4 min, p<0.05) and in vigorous PA in green space vs. hardscape (2.3±0.2 vs. 1.1±0.1 min, p<0.05). Small group activity was positively correlated with the frequency of prosocial interactions (r = -.58, p<0.001). In asphalt schoolyards, students spent more time vigorous when more play options were available (2.1±0.2 vs. 1.3±0.1 min, p<0.05). Although active minutes were similar between sexes in areas with trees, logs, and woodchips (girls: 4.8±3.0; boys: 5.4±0.7 min, p>0.05), boys spent more time active in both hardwood (girls: 3.6±0.2 vs. 4.9±0.2 min, p<0.05) and softwood areas (girls: 3.0±0.2 vs. 3.8±0.2 min, p=0.05). **Conclusion**: Schoolyards that increase access to nature, provide diverse sport and non-sport play options, and present motor skill challenges optimize MVPA participation and positive peer interactions for both sexes and all age-groups in urban low-income elementary schools.

### Board #7 May 30 9:00 AM - 11:00 AM

#### Relationship Between Physical Activity Among Preschool Children And Their Parents

Kiseiku Koizumi. Chiba University, Chiba-city, Japan.

(No relevant relationships reported)

**Purpose**: The lack of physical activity among children is a global issue that requires attention. It has been suggested that a relationship exists between the lifestyles of children at an early age and that of parents. We quantified physical activity relationships among preschool children and their fathers and mothers. **Methods**: Forty-seven children (kindergarten level: aged 6.1± 0.2 years) and their parents (fathers: aged 43.1± 4.83 years, mothers: aged 41.1± 4.29 years) participated in this study. Each participant wore an activity tracker on the waist during waking hours to measure step counts and time of moderate-to-vigorous physical activity (MVPA). The data were divided into work/school day and day off and evaluated accordingly. Partial correlation coefficient was used to evaluate the physical activity relationships between children and fathers or mothers. **Results**: For the work/school days, there was a significant positive correlation of step count between children and mothers (children: 15,800 ± 2,560 steps; mothers: 9,450 ± 2,590 steps, r = 0.322, p < 0.05) and a nonsignificant correlation between children and fathers (8,820 ± 2,990 steps, r = 0.249). For the days off, there was a significant positive correlation of step counts between children and fathers (children: 11,700 ± 3,520 steps, fathers: 8,190 ± 2,790 steps, r = 0.473, p < 0.01) but no significant correlation between children and mothers (10,000 ± 2,530 steps, r = 0.096). There was a significant positive correlation in MVPA time for days off between children and fathers (children: 47.5 ± 25.9 min, fathers: 51.0 ± 22.5 min, r = 0.487, p < 0.01) but no significant correlation between children and mothers (8.42 ± 7.44 min, r = 0.123, p = 0.223). Overall, the degree of similarity in PA participation and positive peer interactions for both sexes and all age-groups in urban low-income elementary schools.

### Board #8 May 30 9:00 AM - 11:00 AM

#### Effects Of Four-day School Weeks On Physical Education Exposure And Childhood Obesity

Emily J. Tomayo, Paul N. Thompson, John M. Schuna, Jr., Katherine B. Gunter, FACSM. Oregon State University, Corvallis, OR. (Sponsor: Katherine Gunter, FACSM)

Email: emily.tomayo@oregonstate.edu

(No relevant relationships reported)

Schools are critical venues to support child health and wellbeing. One mechanism to influence these outcomes is via school-based physical activity, but substantial declines in funding have forced many school districts to consider cost-cutting measures that may impact physical activity exposure and related outcomes. Use of four-day school weeks (FDSWs) as a potential cost-saving strategy has increased substantially, particularly in rural areas, which contain ~90% of FDSW districts. However, evidence regarding impacts of FDSWs on child health and related factors is lacking. **Purpose**: To examine physical education (PE) exposure and childhood obesity prevalence in four- and five-day Oregon schools. We hypothesized lower PE exposure and higher obesity in four- versus five-day models given reduced school
G-22 Thematic Poster - Running Technique Interventions

Saturday, May 30, 2020, 9:00 AM - 11:00 AM
Room: CC-2011

3645 Chair: Irene S. Davis, FACSM. Harvard Medical School Spaulding-Cambridge, Cambridge, MA.
(No relevant relationships reported)

3646 Board #1 May 30 9:00 AM - 11:00 AM
The Effect Of Backward Running On Patellar Tendon Loading
Naghmeh Gheidi, Thomas W. Kernozek, FACSM, Alexis Mehir, Lauren Strommen, Carolyn Apfelbach. UWL, La-Crosse, WI.
(Sponsor: Thomas W Kernozek, FACSM)
Email: ngheidi@uwlaux.edu
(No relevant relationships reported)

3647 Board #2 May 30 9:00 AM - 11:00 AM
Influence Of Running Speed On Muscle Activity During Backward Running With Body Weight Support
Kenji Masumoto1, John A. Mercer, FACSM2. 1Kyushu University, Fukuoka, Japan. 2University of Nevada, Las Vegas, NV: (Sponsor: Professor John A. Mercer, FACSM)
(No relevant relationships reported)

A change in running speed influences gait mechanics of running. PURPOSE: The purpose of this study was to investigate the influence of a change in running speed on muscle activity during forward and backward running at different body weight support (BWS) conditions. METHODS: Eleven participants (29.7 ± 12.3 years) ran forward and backward on a lower body positive pressure treadmill at 0%BWS, 20%BWS, and 50%BWS conditions. The running speed conditions consisted of forward and backward running at preferred speed (PS), PS±10%, and PS±-10%. Muscle activity from the rectus femoris, biceps femoris, tibialis anterior, and gastrocnemius and stride frequency were measured. Muscle activity and stride frequency were analyzed using a 2 (running direction) × 3 (BWS) × 3 (running speed) repeated measures analysis of variance (α = 0.05). RESULTS: Muscle activity from the rectus femoris (P<0.01) and gastrocnemius (P<0.01) were significantly different between running speeds. For example, muscle activity from the rectus femoris (P<0.05) and gastrocnemius (P<0.05) during running at PS were significantly greater than when running at PS±10%, regardless of running direction and BWS. Furthermore, muscle activity from the rectus femoris (P<0.01) and gastrocnemius (P<0.05) during running at PS±10% were significantly greater than when running at PS, regardless of running direction and BWS. Stride frequency was influenced by the interaction of running direction and running speed (P<0.05). Using the pairwise comparisons, stride frequency during running at PS was significantly higher than that of running at PS±10% only when running forward and backward at 0%BWS (e.g., 84.5 strides/min and 82.0 strides/min for forward running at PS and PS±10% conditions, respectively: P<0.05). Furthermore, stride frequency during running at PS±10% was significantly higher than that of running at PS during forward and backward running at 0%BWS (P<0.05). CONCLUSIONS: Muscle activity from the rectus femoris and gastrocnemius during running may increase with increasing running speed, regardless of BWS and running direction. However, unique biomechanical strategies for the increased muscle activity from the lower extremity may exist for running with BWS.

The Effect Of Synchronous And Asynchronous Music On Treadmill Running Performance Of Recreational Athletes
Dimitrios Katsavelis, Isaac Burright, Megan Quast, Megan Ackerman, Erika Piper, Brooke Farmer, Terry Grindstaff. Creighton University, Omaha, NE.
Email: DimitriosKatsavelis@creighton.edu
(No relevant relationships reported)

Background: Running with synchronous music tempo is associated with positive physiological and psychological effects that improve running performance as expressed by time to exhaustion. Changes in the music tempo may increase physiological efficiency (slow tempo) or improve motivation and mood (fast tempo), but there is no conclusive evidence whether asynchronous music tempo can influence distance covered or time to exhaustion. Purpose: To investigate the effect of different music tempi on running performance, force and cadence profiles of recreational athletes. Methods: Six college students (age = 21.2 ± 3yr; weight = 75.4 ± 12kg; height = 179.5 ± 10cm) participated in the study. The participants were tested five times over a period of three weeks. During the first visit, lactate threshold speed (LTS) was assessed via blood samples. During the second visit participants ran at 5% above their LTS (3.5±0.4m/s) with no auditory stimuli until exhaustion. During the last three visits participants were randomly assigned to run on an instrumented treadmill in three different tempo conditions until exhaustion: slow, matched and fast. Time to exhaustion, vertical ground reaction forces (vGRF) and cadence were calculated through Matlab.
Results: A one-way repeated ANOVA (4 conditions) showed that there was a main effect of music, with no music condition resulting in a decrease in time to exhaustion by 18-21% when compared to all the music conditions, but no significant differences among the 3 music conditions. The vGRF during running at slow tempo (2.58 BW) were significantly lower when compared to fast tempo (2.62 BW), whereas there was an increase in cadence between slow (167 steps/min) and fast (170 steps/min) tempo conditions. Conclusion: The findings indicate that music – in general – has a positive effect on running performance, while asynchronous tempi can only cause significant but subtle changes (less than 2%) in the force and cadence profiles.

Patellar tendinopathy is experienced in nearly 5% of distance runners during their career. Backward running (BR) has been recommended as a good rehabilitation exercise for patellofemoral pain patients as an intermediate progression from walking to forward running (FR). However, no studies have compared how BR affect patellar tendon stress. Purpose: Identify differences in patellar tendon (PT) stress during FR (heel strike pattern) and BR. Methods: Twenty healthy male runners (Age: 21 ± 6.9 years, Height: 1.8±0.6 m, Mass: 76.2±14.1 kg, weekly running distance: 22.3±7.6 km) participated in this study. Each performed 5 trials of over-ground FR (heel strike pattern) and BR with a running velocity of 2.6-3.4 m/s based on photoelectric timing. Kinematic data were collected at 180 Hz using a 15-camera motion capture system. Ground reaction forces (GRF) were collected at 1800 Hz using a force platform. The Newton- Euler inverse dynamics method was used to calculate the net knee joint moment. The average moment arm of each quadriceps muscles were determined using Graphics-Based Model. The net knee moment was then divided by this knee moment arm to determine the quadriceps muscle forces. Results: There were differences between FR and BR for all variables, except for GRF (p<0.01). Knee moment (154.7 ± 205.1 Nm), PT stress (47.42 ± 60.06 MPa) and PT force (4335 ± 5497 N) in BR were around 21-24% less than FR. In addition, knee joint (20.84 vs. 37.72 deg) exhibited near 45% less range of motion during BR.

Conclusion: In addition, knee joint (20.84 vs. 37.72 deg) exhibited near 45% less range of motion during BR. This may be required to stabilize the tibia during stance phase placing a greater stress on the patellar tendon. BR results in lower PT stress when compared to FR. The lower PT stress as well as higher coordination variability may make BR more suitable for rehabilitation in patients with patellar tendinopathy as a progression exercise to FR due to its lower PT stress.

PATIENT PROFILES AND THEIR ENHANCED EDUCATIONAL EXPERIENCE THROUGH BIG DATA EXPERIENCE: We linked longitudinal FDSW data to existing data that included 1) school-level PE exposure for all Oregon elementary schools in 2011-2012 and 2017-2018 (n=1296 and 1243 schools, respectively) and 2) child-level body mass index z-scores from a state representative sample of 1st-3rd graders (n=4,625 children, 2011-2012). Instructional time, enrollment, demographics, and pupil-teacher ratio also were examined. T-tests compared mean school-level factors between four- and five-day schools overall and in rural schools only; complex samples weighted t-tests clustered at the school-level compared mean obesity data across school models. RESULTS: Enrollment, instructional time, and pupil-teacher ratio were significantly lower in four- versus five-day schools. FDSW schools provided significantly more PE, both as an absolute measure (120 vs. 101 minutes/week in four- vs. five-day schools in 2017-2018, p<0.01) and relative to total instructional time (6.9% vs. 5.0% in four- vs. five-day schools, p<0.001). There were no differences in obesity prevalence between school models. CONCLUSIONS: The increased PE exposure in FDSW schools was unexpected, but it is unknown if this increase was related to a lack of difference in obesity prevalence. Given the known health and educational disparities experienced in rural communities, it is critical to better understand how FDSW use impacts physical activity, obesity risk, and other related factors for children in rural schools.

Running with Synchronous Music Tempo Has a Positive Effect on Running Performance, While Asynchronous Tempi Can Only Cause Decrease in Force and Cadence Profiles of Recreational Athletes

Running With Synchronous Music Tempo Is Associated With Positive Physiological And Psychological Effects That Improve Running Performance As Expressed By Time To Exhaustion. Changes In The Music Tempo May Increase Physiological Efficiency (Slow Tempo) Or Improve Motivation And Mood (Fast Tempo), But There Is No Conclusive Evidence Whether Asynchronous Music Tempo Can Influence Distance Covered Or Time To Exhaustion. Purpose: To Investigate The Effect Of Different Music Tempi On Running Performance, Force And Cadence Profiles Of Recreational Athletes. Methods: Six College Students (Age = 21.2 ± 3yr; Weight = 75.4 ± 12kg; Height = 179.5 ± 10cm) Participated In The Study. The Participants Were Tested Five Times Over A Period Of Three Weeks. During The First Visit, Lactate Threshold Speed (LTS) Was Assessed Via Blood Samples. During The Second Visit Participants Ran At 5% Above Their Lts (3.5±0.4m/s) With No Auditory Stimuli Until Exhaustion. During The Last Three Visits Participants Were Randomly Assigned To Run On An Instrumented Treadmill In Three Different Tempo Conditions Until Exhaustion: Slow, Matched And Fast. Time To Exhaustion, Vertical Ground Reaction Forces (vGRF) And Cadence Were Calculated Through Matlab.
Results: A One-way Repeated ANOVA (4 Conditions) Showed That There Was A Main Effect Of Music, With No Music Condition Resulting In A Decrease In Time To Exhaustion By 18-21% When Compared To All The Music Conditions, But No Significant Differences Among The 3 Music Conditions. The vGRF During Running At Slow Tempo (2.58 BW) Were Significantly Lower When Compared To Fast Tempo (2.62 BW), Whereas There Was An Increase In Cadence Between Slow (167 Steps/min) And Fast (170 Steps/min) Tempo Conditions. Conclusion: The Findings Indicate That Music – In General – Has A Positive Effect On Running Performance, While Asynchronous Tempi Can Only Cause Significant But Subtle Changes (less than 2%) In The Force And Cadence Profiles.
Resistance training is important to maintain an athlete’s health and regain strength after injury. Light-weight wearable resistance allows loading in the context of sport specific movements and can lead to specific strength adaptations benefiting the athlete. However, limited knowledge of the associated biomechanical changes with such a training modality exists.

Purpose: To determine biomechanical changes during running with lower limb light-weight wearable resistance.

Methods: Fourteen healthy participants volunteered for the study (age: 28±1 years; height: 180±8 cm; body mass (BM): 77.16 kg). Participants wore shorts and calf sleeves allowing attachment of light loads and performed 4 x 2 mins 20-m over-ground shuttle running bouts at 3.3 m*s⁻¹, alternating by 3 mins rest. The first running bout was unloaded and the other three bouts under randomised loaded conditions. The loaded conditions consisted of 1 %, 3 % and 5 % additional loading of the BM. Loads were distribution on the legs with 2/3 on the thigh and 1/3 on the shank. Two force plates embedded in the floor at the 10-m mark of the runway recorded peak vertical ground reaction forces (vGRF) and ground contact time (GCT). Recorded kinetic data wasfiltered using a low-pass Butterworth filter at frequency 120 Hz and normalised to body weight. A repeated measures ANOVA (α ≤ 0.05) was used to determine differences between conditions and Cohens d was calculated with effect sizes defined as small (d = 0.2), medium (d = 0.5) and strong (d = 0.8).

Results: Peak vGRF decreased (-0.5 %) with additional loading of 1 % BM (d = 0.13, p = 0.19, d = 0.5) and slightly increased (+1.1 %) with 3 % BM loading (d = 0.13, p = 0.91) compared to unloaded condition. Higher peak vGRF (+1.4 %) was also found during 5 % BM loading (d = 0.19, p < 1). Ground contact time showed no significant differences (0.13 ≤ p ≤ 0.20, 0.4 ≤ p ≤ 1) between all conditions and only a slightly increased with 5 % BM loading (+1.1 %).

Conclusion: Small changes in peak vGRF and GCT during loaded running occurred. Maintaining targeted speed and running economically might result from kinematic adaptations, needing further evaluation. Additionally, examination of acute neuromuscular alterations, hypothesised by increased muscular output before gait pattern changes develop, are necessary for appropriate use of light-weight wearable resistance.

An increased running step rate (i.e., cadence) can decrease lower extremity joint loads and potentially reduce running-related injury (RRI) risk. Many gait interventions have significantly increased a runner’s cadence through a variety of external stimuli (e.g., metronome). Runners have been shown to spontaneously manipulate their cadence when listening to music with a tempo that differed ±3% from their baseline cadence. However, no study has determined whether a runner will subconsciously increase cadence > 3% when listening to up-tempo music.

Purpose: To determine if music tempo (beats per minute, bpm) set 10% higher than baseline cadence affects running cadence when listening to music with a tempo that differed ±3% from their baseline cadence. Ten healthy subjects (age 23±1 years, mass 67±16 kg, height 168±11 cm) participated. Subjects performed 3 running trials, at a self-selected pace, on an instrumented treadmill while collecting kinematics and kinetics. First, a baseline running gait was established, then each subject was given the instruction to “push yourself forward with your hips and glutes” or “push yourself forward with your toes and ankles” in a randomized order. After 1 minute to adapt to each condition, 30 seconds of data were recorded. Variables of interest included peak sagittal hip, knee, and ankle moments and positive, negative, and total sagittal work at the hip, knee, and ankle. One-way repeated measures ANOVAs were used to assess kinetic changes across conditions.

Results: There was a significant main effect of running cue with respect to negative and total work at the ankle (p = 0.031 and p = 0.002). Post-hoc analyses indicated that ankle negative work was greater when running with the ankle cue compared to baseline running (0.44±0.17 J/kg vs -0.38±0.14 J/kg; p = 0.031) and ankle total work was greater when running with the ankle cue compared with baseline and hip cue running (p = 0.019 - 0.008). There were no significant differences in any of the other lower extremity sagittal moments or work across tasks (p > 0.05).

Conclusions: Subjects demonstrated increased negative and total work at the ankle in response to the ankle running cue. There was no change in positive work, which was anticipated with a cue emphasizing forward propulsion. Running kinetics remained largely unchanged in response to either running cue, possibly due to the quality of the cue (i.e. internal rather than external focus). These data suggest telling clients to “use your hip more to run” may not be an effective method to change running mechanics.
CONCLUSION: Spatiotemporal running mechanics do not spontaneously adjust when runners listen to motivational music set at a tempo 10% greater than baseline cadence. Listening to up-tempo music should not be considered an effective external stimulus to promote increased running cadence.

Figure 1: Mean and standard deviations for positive knee (A) and hip (B) joint work and negative knee (C) and hip (D) joint work prior to and following the LHR for the MAX and CON groups. * denotes statistically significant difference. # denotes data trending towards a statistical difference.

HISTORY: Male Olympic swimmer (100 m breaststroke; 32 y, 96.0 kg, 185 cm) with recurrent hypoglycemia and -related symptoms (hand sweating, blurred vision) at rest and during training and expressive weight loss on training days.

DIFFERENTIAL DIAGNOSIS:
1. Hypoglycemia at rest and during training sessions;
2. Body fat percentage: 14.9%;
3. Low fat oxidation at rest (45% of basal metabolic rate).

TEST AND RESULTS: Basal metabolic rate was of 2.360 kcal with glycolytic predominance (55% of total energy expenditure), confirming that energy metabolism is highly dependent of carbohydrate intake. At the beginning and end of the week, morning weight was 96.0 and 93.0 kg, respectively. Blood glucose pre-exercise was 84.0 mg/dl and 60 mg/dl post-exercise.

FINAL WORKING DIAGNOSIS: Training-induced severe hypoglycemia and expressive weight loss across the week. It was hypothesized that such events occur since in response of the elevated activity of glycolytic pathway and consumes and consumption of high glycemic index supplements during training.

TREATMENT AND OUTCOMES:
1. We focused on nutritional intervention based on high calorie intake and substitution of high by low glycemic foods and supplements throughout the day;
2. Additionally, we recommended beta-alanine supplementation (4 x 1.6 g) to prevent metabolic acidosis;
3. After 2 weeks of intervention, no symptoms of hypoglycemia were reported at rest and during training sessions;4. Weight loss was attenuated (~ 1.6 kg) and blood glucose values did not decrease after training (pre: 80 mg/dl; post: 125 mg/dl).
3659 May 30 9:40 AM - 10:00 AM You Only Get One Bite Out Of This Apple
Jonathan R. Guin, Thomas J. Bolluert, James B. Robinson. University of Alabama, Tuscaloosa, AL. Email: jrguin@gmail.com (No relevant relationships reported)

HISTORY: A 21-year-old collegiate tight end sustained anterior neck trauma from his chin strap during a regular season game. During the first quarter, the athlete was struck in his anterior neck by an opponent’s face mask. The patient felt throat pain and states it felt like his “Adam’s Apple is to the right”. He then went back into the game because he noted the pain was only mild, and he was otherwise asymptomatic. The athlete was able to continue playing until the early part of the third quarter of the game. At that time, he was evaluated by the team physician and held from the rest of the game. He was then sent to the emergency department for further evaluation and imaging.

PHYSICAL EXAMINATION: Examination on the sideline revealed a click upon palpation of the anterior neck near the thyroid cartilage. He had full ROM of his cervical spine with a normal neurological exam. He had no respiratory distress, subcutaneous crepitus, or voice changes. He did have some pain with swallowing. Hyoid bone and cricoid cartilage is non-tender. Cardiac and pulmonary exams were also unremarkable. Exam was stable when repeated in emergency department.

DIFFERENTIAL DIAGNOSIS: Fracture of Thyroid Cartilage Fracture of Hyoid BoneContusion of NeckCarotid Artery Dissection

TEST AND RESULTS: CT Neck with Contrast

TREATMENT AND OUTCOMES: The patient tolerated the procedure well and has since experienced only mild hip pain consistent with FAI.

6. It is likely the patient’s flares of pain over the previous 3 years were ovarian in etiology but disguised due to her irregular menstrual cycle and coincident chronic FAI. Ovarian etiology should be included in the differential for female athletes experiencing surges of lower quarter abdominal pain in a setting of hip pain.

3661 May 30 10:20 AM - 10:40 AM Ehlers-Danlos Syndrome And CD5 Deficiency In A 22 Year-old Male
Thomas Lowder, Courtney Holloway. UNIVERSITY OF Central Arkansas, Conway, AR. Email: tlwoder@uca.edu (No relevant relationships reported)

HISTORY: A previously-active male presented with joint pain at age 15. He is positive for joint hypermobility and dislocation/subluxation, joint pain, food allergies, gastritis, gastroesophageal reflux, and CD5 immune deficiency (diagnosed at age 5, one of eight in the world at the time). He has a family history of aortic aneurysm.

PHYSICAL EXAMINATION: The patient exhibited joint pain and extreme hypermobility on examination. Genetic tests were performed on the patient, his mother, and his sister.

DIFFERENTIAL DIAGNOSIS: While there exists a family history of hypermobility, along with orthostatic hypotension in this patient (consistent with Ehlers-Danlos Syndrome, or EDS) the patient also exhibits CD5 immune deficiency, psychogenic seizures, a likely pathogenic variant in the AK2 gene (c.656delT), associated with reticular dysgenesis. His sister also carries this variant. He also carries the variant associated with cystic fibrosis, the congenital bilateral absence of the vas deferens, and chronic pancreatitis.

TEST AND RESULTS: We are presently working with this patient to determine if a moderate-intensity exercise program yields a decrease in joint pain, hypermobility, and downregulation of gene expression.

FINAL WORKING DIAGNOSIS: This is a work-in-progress of a patient with two rare diseases and a variety of genetic issues, which to our knowledge have never been exhibited in a single patient.

TREATMENT AND OUTCOMES: We will present working data and determine if an exercise intervention has a positive impact in this patient.

3662 May 30 10:40 AM - 11:00 AM Left Flank Injury - Soccer
Jiao Xue. Pomona Valley Hospital Medical Center, Pomona, CA. Email: jiao.xue.md@gmail.com (No relevant relationships reported)

HISTORY: A 17-year-old senior high school soccer player sustained an elbow strike from opposing player to his left flank while practicing. Later that night, he experienced excruciating pain which led him coming to ED the following day. He was discharged despite elevated blood pressure (BP). 4 weeks later, he saw his primary care doctor who noted elevated BP in addition to flank pain, and patient was recommended to go to ED after concerning ultrasound findings. PHYSICAL EXAMINATION: On initial presentation to ED, patient’s BP was 152/96. Examination revealed visible distention in the left abdomen. Palpable mass was appreciated in the same region while lying down. Tenderness to palpation to the left abdomen and left costovertebral angle were noted.

DIFFERENTIAL DIAGNOSIS: Left kidney hematoma v.s. muscular hematoma v.s. kidney contusion v.s. renal arteriovenous malformation v.s. ruptured spleen v.s. kidney mass

TEST AND RESULTS: CT Abdomen & Pelvis W/NO Contrast revealed a 12 cm left perinephric hematoma with significant mass effect on the left kidney. Otherwise, CBC and BMP were unremarkable.

FINAL WORKING DIAGNOSIS: L subcapsular renal hematoma secondary to trauma

TREATMENT AND OUTCOMES: IR placed a pigtail drain with 1L output on the 1st day. BP was treated with amiodipine 2.5mg and Hydrozalazine 5mg PRN. Patient was discharged on the 4th day. On the day of discharge, patient’s pain fell out accidentally during a school dance. An Trauma surgeon evaluated him in an outpatient setting. No additional imaging was done given he was asymptomatic. A few weeks later, he developed abdominal/back pain as well as headaches. He presented to Children’s Hospital with hypertension to 170s/110s. Ultrasound showed 1cm left subcapsular hematoma with significant compression of left kidney. IR placed another drain which was eventually removed after 3.5 weeks. Prior to discharge, BP improved to 130’s/70’s
without medications. After discharge, patient was followed by a Pediatric Urologist with monthly imaging. 10 months later, he still had a small 0.5cm hematoma. Patient continues to have mildly elevated BP of unclear etiology. He was evaluated by a Pediatric Cardiologist, and echo did not show evidence of heart disease (LVH). He has not played soccer since the injury.

G-24 Clinical Case Slide - Thigh and Leg II

Saturday, May 30, 2020, 9:00 AM - 10:40 AM
Room: CC-2222

3663 Chair: Mary Lloyd Ireland, FACSM. UK Healthcare Sports Medicine, Lexington, KY.
(No relevant relationships reported)

3664 Discussant: Melody Hubbs. Rothman Orthopaedics, New York, NY.
(No relevant relationships reported)

3665 Discussant: Anastasia Noel Fischer, FACSM. Nationwide Children's Hospital, Columbus, OH.
(No relevant relationships reported)

3666 May 30 9:00 AM - 9:20 AM
Calf And Foot Injury- Crossfit

Jeff Nadwodny, Ahmad Al-Awadi, Michael Stiller, George Pujalte, FACSM. Mayo Clinic School of Graduate Medical Education, Jacksonville, FL. (Sponsor: George G. A. Pujalte, FACSM)
Email: Jeffrey.Nadwodny@mayo.edu
(No relevant relationships reported)

HISTORY: A 51-year-old female presented with three-year worsening left lower leg and foot pain. No injury at time of onset but was active with CrossFit five times weekly. Pain began on bottom of foot with radiation through the sole of foot to posterior calf and popliteal fossa. Pain described as 7-8/10 in intensity, constant, sharp/stabbing in nature, with burning sensation on the bottom of foot. Associated with weakness of the left ankle, foot drop requiring patient to wear an ankle-foot orthotic, swelling, and color changes with her foot turning blue/red intermittently. Pain was unrelieved with oral NSAIDS, steroids, and only temporary relief with topical anti-inflammatory gel, heat/ice, deep tissue massage, and dry-needling with physical therapy.

PHYSICAL EXAMINATION: Examination revealed skin color changes with blue discoloration of left foot that was cool to touch. Tender to palpation maximally over left gastrocnemius muscle, Achilles tendon, sole and ball of foot; 0/5 strength with left ankle dorsiflexion/plantar flexion, ankle inversion/eversion or great toe extension. Sensation intact to posterior calf and popliteal fossa. Pain described as 7-8/10 in intensity, constant and severe. He reported no prior injuries to his right calf before. He has taken over-the-counter ibuprofen with some relief of his symptoms. His pain is constant and severe. He reported no prior injuries to his right calf before.

Physical Examination: Antalgic gait. Inspection of the right foot and ankle revealed minimal ecchymosis over the medial mid-gastrocnemius. There was moderate tenderness to palpation over the medial greater then lateral gastrocnemius muscle belly. Range of motion at the right ankle including dorsiflexion, plantarflexion, inversion, and inversion were normal. Strength was 4-5 with right resisted plantarflexion but otherwise normal. Reflexes and sensation were grossly intact. Special tests including tib-fib squeeze, Thompson, anterior drawer, and talar lift were negative. Distal pulses were intact.

Differential Diagnosis: 1. Medial gastrocnemius strain 2. Tibia or fibular fracture 3. Acute peroneal nerve injury

Test and Results: Radiographs 4 views of the right tibia and fibula with soft tissue swelling and fullness in calf on lateral view. MRI right tibia and fibula with acute tear of the anterior gastrocnemius aponeurosis with a longitudinal component as well as a retracted transverse component.

Final Working Diagnosis: Acute L- Pattern tear of the aponeurosis of the medial calf

TREATMENT and OUTCOMES: 1. Offload right lower extremity with walking boot 2. Course of physical therapy for 6 weeks 3. Indomethacin 50 mg BID for the next 10 days to help reduce risk of heterotopic ossification development in the calf 4. Follow up in 6 weeks for reevaluation and repeat radiographs

3668 May 30 9:40 AM - 10:00 AM
Lower Leg Injury - Basketball

Duke Yi-Fu Yeh. Pomona Valley Hospital Medical Center, Pomona, CA.
Email: Duke.Yeh@pvhmc.org
(No relevant relationships reported)

HISTORY: 24-year-old male basketball player presented to clinic with left lower extremity pain after inverting left ankle during a game. Immediately after the injury he grabbed his proximal fibula. He experienced moderate lateral ankle pain that’s sharp and throbbing. He could bear weight but was unable to play. He also had swelling near the proximal fibula. The pain was worse with movement and relieved with rest, ice and elevation.

PHYSICAL EXAMINATION: He was limping favoring his left side.

3. Gabapentin 600mg BID
4. Referral to Pain Medicine for lumbar sympathetic nerve block
Hi-ya!: A Rare Quadriceps Lesion In A Rising Champion

Jose F. Velasquez, James Pearson, Alex Casey, Hamed Shalikar. Emanate Health, West Covina, CA.
Email: jfvelasquezmd@gmail.com

HISTORY: A 10-year-old Female w/o past medical history was brought to the ED by her mother due to left leg pain and swelling. The mother states that the patient practices taekwondo. 3 days before during training, she sustained a direct kick over the left thigh. The patient states that since then she has been having pain. Mother has been doing supportive care at home including ice, Epsom salt compresses, and Arnica. The mother states that despite the pain, the patient continued training. The mother states that the pain and swelling have markedly increased over the left thigh and knee, which started to impair ambulation with associated excruciating pain on palpation. The patient was taken to urgent care where X Rays ruled out a fracture. The patient was able to have pain free AROM and PROM and regained 5/5 strength in left ankle motions, except 5/5 in Long Peroneal. At 4 weeks follow-up, all symptoms resolved and he was cleared to return to 15 minutes of contact practice.

TREATMENT AND OUTCOMES: 1. Cam walker boot 3 weeks with weekly exams/XRs. 20 days out from injury completely normal RLE exam, no pain, full ROM, XR's suggestive for healing SH2 fracture; patient was able to return to football as tolerated. DISCUSSION: In isolation this is a very rare injury. There was one reported case of a SH2 fracture that presented with initial knee injury and ROM deficits that was treated non-operatively. Most injuries to the proximal fibula of the fibula occur in combination with an interossaese membrane/syndesmotic and distal tibiofibular injury - must rule out a Maisonneuve injury. The presenting complaint was pain and edema in the region of the soleus this may have been a soleus traction injury to the apophysis vs direct trauma from the fall.

He landed on his right lateral leg with immediate pain to the fibular head. There was no numbness, tingling, weakness or radiation of pain however he had a noticeable limp. He presented to clinic 2 days later and denied any prior injuries or trauma to the area. PHYSICAL EXAMINATION: 2 days post injury (PCP office) — No deformity, normal knee and ankle exams, no bony tenderness, moderate posterolateral edema of proximal right lower leg, painful/antalgic gait, TTP lateral gastrocnemius and soleus, negative Thompson’s 4 days post injury (Sports Medicine Clinic) — Consistent with prior exam, new findings: point TTP just distal to fibular head, decreased edema, negative squeeze test, negative ER test.


TEST AND RESULTS: XR. R Tib/Fib AP and Lateral radiographs 2 days after injury — Bones/joints/soft tissue appear unremarkable. Repeat XR 13 days post injury — sublux irregularity along the lateral aspect of the proximal fibula physis with associated periostitis. Final XR 20 days post injury — Noted irregularity along the lateral aspect of the proximal fibula physis with increased benign periostitis.

FINAL WORKING DIAGNOSIS: Salter-Harris II fracture of R proximal fibula physe.

TREATMENT AND OUTCOMES: 1. Cam walker boot 3 weeks with weekly exams/XRs. 20 days out from injury completely normal RLE exam, no pain, full ROM, XR's suggestive for healing SH2 fracture; patient was able to return to football as tolerated.
Although related to vascular dysfunction during pregnancy, Flt-1 was not significantly elevated during pregnancy compared to non-pregnancy levels (443±31 pg/ml, p=0.22) or during pregnancy (408±20 versus 430±20 pg/ml, p=0.23). RH; β=0.01±0.01, p=0.50. There was no difference in Flt-1 levels between women or at the time of vascular testing.

Purpose: Physical inactivity is associated with leg macrovascular impairment following 6 hours of uninterrupted sitting or 5 days of reduced physical activity, however vascular responses in the upper limb are less clear. Indeed, the impact of physical inactivity on both arm and leg macrovascular and microvascular function over a 72-hour period remains unknown. This may be important as it represents a real-world scenario of an active individual during the workweek, followed by sedentary behavior over the weekend. Further, previous studies have investigated the popliteal artery, which does not assess the entire lower limb. We tested the hypothesis that 72 hours of reduced activity (<5000 steps/day) would result in reduced brachial artery (BA) and superficial femoral artery (SFA) resting shear rate, microvascular function (reactive hyperemia-RH), and microvascular function (flow-mediated dilation-FMD). METHODS: Physical activity was monitored for the week prior to and during the 72 hours of inactivity in 5 healthy, young men who were currently physically active. BA and SFA resting shear rate, RH (shear AUC), and FMD were measured via duplex Doppler ultrasound before (Pre) and after (Post) a 72-hour inactivity period. RESULTS: In the SFA, resting shear rate (Pre: 53±17 s-1; Post: 32±14.7; P=0.03) and RH (Pre: 23376±6266 AU; Post: 16580±3304 AU; P=0.01) were significantly reduced after a 72-hour inactivity period. Similarly, BA resting shear rate and RH tended to be reduced (P=0.09 and P=0.07, respectively). Finally, FMD was unchanged in both the BA and SFA (P=0.05).

CONCLUSIONS: Herein, we demonstrate that resting hemodynamics and microvascular function are reduced over 72 hours of inactivity, while macrovascular function is preserved in the upper and lower limbs. These findings may highlight a distinction between the vascular impact of short-term sitting studies versus longer term inactivity studies, as the brachial artery appears to be more affected by the latter. Vascular adverse pregnancy outcomes (APOs) are characterized by elevated levels of antiangiogenic Fms-like tyrosine kinase (Flt-1), attributable to placental ischemia. Flt-1 directly impairs endothelial function during pregnancy and contributes to maternal features of APOs, but infusion of Flt-1 into non-pregnant animals did not cause endothelial dysfunction. Purpose: The purpose was to evaluate the relation of Flt-1 and endothelial function in women 6 months – 3 years after delivery. Given the angiogenic effects of exercise, we tested the hypothesis that Flt-1 would be lower in women who achieve adequate pre and current physical activity (PA). Methods: 40 nonsmoking women free from diabetes and use of protease inhibitors (mean age: 33±1 yrs, mean BMI: 26.3±1.0 kg/m², 58% with adequate pregnancy PA) completed a blood draw and vascular testing after an overnight fast. We used an ELISA assay to determine levels of circulating Flt-1. Reactive hyperemia (RH) was measured with venous occlusion plethysmography to quantify resistance vessel endothelial function. A validated physical activity questionnaire (Godin Leisure Time Exercise Questionnaire) was used to determine current and second trimester PA; APO history was determined using self-report. We tested for associations of RH with continuous levels Flt-1 using multiple linear regression analyses. Results: Participants’ average age was 9 years, with 70% of EW children having HBP vs. 24% in the NW group (p<0.001). The probability of HBP decreased with increasing V02peak in the EW group only (β=0.09, p=0.009). There was no association between CRF and probability of HBP in NW children. eGFR was lower in the less-fit groups than in more-fit groups regardless of adiposity status, even after adjusting for age and blood pressure status (adjusted mean difference between more-fit and less-fit groups: EW=-7.1 ml·min⁻¹·1.73 m²⁻¹, p=0.0046 and NW= -2.9 ml·min⁻¹·1.73 m²⁻¹ p=0.0144). Conclusion: The probability of HBP dramatically decreases with increasing CRF in children with EW but not in children with NW. eGFR is lower in children in lower CRF, regardless of obesity status, but the effect of CRF on an kidney function is greater in EW than in NW kids. Patients with peripheral artery disease (PAD) are sedentary due to claudication pain in the lower extremities. Our research has documented an inability of the ankle plantarflexors to generate normal push-off during walking. An ankle-foot orthosis (AFO) to offset push-off deficiency may improve physical activity levels and walking distances in patients with PAD. Purpose: To compare step count (SC), peak activity index (PAI), initial claudication distances (ICD), and absolute claudication distances (ACD) before and after an AFO intervention. Methods: Six patients with PAD (Age: 71 ± 9.3 years; Body Mass Index: 27.5 ± 5.5 kg/m²) were enrolled in the study. They underwent measurements of SC and PAI over a week using an accelerometer (ActiGraph®). ICD and ACD were determined while subjects performed the Gardner treadmill protocol without wearing AFOs. All measures were assessed before and after the three month AFO intervention. Signed Rank tests were performed to determine differences following the intervention. Results: ACO was significantly increased following the AFO intervention (p=0.046). Mean ACO was 312 ± 169 meters at baseline and increased to 364 ± 194 meters after the three month AFO intervention. Measures before and after the AFO intervention of SC (2422 ± 1166 steps/day and 2349 ± 1112 steps/day), PAI (34 ± 13 steps/min and 30 ± 7 steps/min), and ICD (187 ± 111 meters and 173 ± 138 meters) were not significantly different. Conclusion: The preliminary results of this study indicated that the AFO intervention improves the ACD in patients with PAD while walking without AFO. Future work should increase the number of subjects and determine whether physical activity intensity levels (light, moderate, and vigorous) changed after AFO intervention.Supported by NIH Grant HD090333-01. We acknowledge Alex Dzewaltowski, Cody Anderson, and Kaeli Samson for supporting this study.

Purpose The role of cardiorespiratory fitness (CRF) in pediatric health is gaining recognition. However, the quality and quantity of the current evidence are insufficient to inform clinical pediatric guidelines. Objective: to evaluate the association between direct measures of CRF and blood pressure status as determined by the 2017 screening guidelines from the American Academy of Pediatrics in school-age children. Methods: Children (n=218) 7 to 10 years old participated in a single-study visit. Children were deemed to have high blood pressure (HBP) if blood pressure status was: elevated, stage-1 or stage-2 hypertension. CRF (V02peak) was measured using an incremental cycle ergometer test. Body composition was measured with DXA, and physical activity with accelerometers (7±1 days). Blood was sampled in the fasting state and estimated glomerular filtration rate (eGFR) calculated using the updated Schwartz equation. Children were categorized as having excess weight (EW) or normal weight (NW) if their fat mass index was above or below 1.73 m²⁻¹. Children were further classified into EW/NW more-fit or EW/NW less-fit using the groups’ median VO2peak. Multiple logistic regression analyses were used to model the probability of high blood pressure against V02peak. Results: Participants’ average age was 9 years, with 70% of EW children having HBP vs. 24% in the NW group (p<0.001). The probability of HBP decreased with increasing V02peak in the EW group only (β=0.09, p=0.009). There was no association between CRF and probability of HBP in NW children. eGFR was lower in the less-fit groups than in more-fit groups regardless of adiposity status, even after adjusting for age and blood pressure status (adjusted mean difference between more-fit and less-fit groups: EW=−7.1 ml·min⁻¹·1.73 m²⁻¹, p=0.0046 and NW=−2.9 ml·min⁻¹·1.73 m²⁻¹, p=0.0144). Conclusion: The probability of HBP dramatically decreases with increasing CRF in children with EW but not in children with NW. eGFR is lower in children in lower CRF, regardless of obesity status, but the effect of CRF on kidney function is greater in EW than in NW kids.
The chemotherapeutic drug doxorubicin (DOX) is commonly prescribed to treat patients diagnosed with cancer. However, patients on DOX cannot take it long term due to its cardiac-toxic effects, as well as skeletal muscle wasting and dysfunction. The mechanism behind why skeletal muscle dysfunction occurs is not well known, so the effects of DOX on skeletal muscle mitochondria are currently being investigated.

**PURPOSE:** To determine the maximal respiration levels in DOX treated C2C12 myotubes. METHODS: Immortalized C2C12 myotubes were cultured in vitro and allowed full differentiation. Fully differentiated cells were then treated with 0.5 μM DOX for 16 hours. Maximal mitochondrial respiration was analyzed with high resolution respirometry. The following substrates were used: digitorum (permeabilize cells); glutamate (G), malate (M) (leak respiration), then ADP (complex I); cytochrome C (mitochondrial membrane integrity); succinate (S) (complex I & II), FCCP (uncoupled respiration); rotenone (Rot) (complex I inhibitor); antimycin A (complex III inhibitor). Results were analyzed using multiple t-tests. RESULTS: DOX caused an 18% reduction in complex I & II supported respiration compared to control (54.6 vs 66.2 JO2, P <0.05), and a 32% decline in complex I supported respiration (37.2 vs 55.2 JO2, P <0.05), and a 26.6% decline in leak respiration (28.6 vs 38.99 JO2, P <0.05). Uncoupled respiration was not significantly different but continued in trend (P <0.08), indicating an overall decrease in mitochondrial respiration. CONCLUSION: Treating C2C12 differentiated myotubes with DOX for 16 hours inhibits complex I & II supported maximal respiration. These findings enable future research to be conducted in order to better understand why these cells are decreasing in maximal respiration. We are currently investigating whether co-treatments can reduce or rescue reduction in respiration caused by DOX.

**CONCLUSIONS:**

DOX increases the amplitude of the decrease in mitochondrial respiration caused by DOX. Further research is needed to identify the mechanisms underlying this effect.

**Max Respiration**

<table>
<thead>
<tr>
<th><strong>J0a (Normalized to Antimycin A)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Respiration State</strong></td>
</tr>
<tr>
<td>Control</td>
</tr>
<tr>
<td>DOX</td>
</tr>
<tr>
<td>G &amp; M</td>
</tr>
<tr>
<td>ADP</td>
</tr>
<tr>
<td>S</td>
</tr>
<tr>
<td>FCCP</td>
</tr>
<tr>
<td>Rot</td>
</tr>
</tbody>
</table>

3692 **Board #9**

**Long-chain Acyl-CoA Synthetases Relate To Fat Oxidation And Storage In Skeletal Muscle Of Lean Humans**

Harrison D. Stierwalt, Sarah E. Ehrlicher, Matthew M. Robinson, Sean A. Newsom. Oregon State University, Corvallis, OR.

Email: stierwalt@oregonstate.edu

(No relevant relations reported)

Recent evidence from genetically altered cell and mouse models indicate long-chain acyl-CoA synthetases (ACSLs), namely ACSL1 and ACSL6, may be critical determinants of partitioning of fatty acids toward oxidation or storage, respectively, within skeletal muscle. However, the role ACSLs serve in skeletal muscle fat oxidation and storage remains to be determined in humans, and it is unknown if ACSLs are altered by acute exercise. **PURPOSE:** To identify 1) relationships between skeletal muscle ACSL1 and ACSL6 protein content and measures of fat oxidation at rest and during exercise, and 2) whether acute exercise induces changes in ACSL protein content in humans. **METHODS:** Sedentary lean adults (n=14 [4M:10F], BMI 22.2 ± 2.1 kg/m2, VO2 max 32.2 ± 4.5 ml/kg/min) completed two metabolic visits in a randomized crossover design. Trials were identical other than completing 1 h of moderate intensity cycling exercise (65% VO2max) or remaining sedentary. The muscle mass decreased only plantaris muscle in the undernutrition group. The level of lipid peroxidation was increased, and the expression levels of SOD-2 in plantaris and soleus muscles were decreased. In addition, the capillary volume, mean luminal diameter and capillary-to-fiber ratio were decreased in both muscles of the undernutrition group. Furthermore, the level of VEGF protein was increased, and thrombospondin-1 was increased in both muscles of undernutrition group. **CONCLUSIONS:** These results suggest that undernourished skeletal muscle induces capillary regression with increased oxidative stress, which also occurs in slow muscle without atrophy.
altered 15 min or 2 h post-exercise (both \( P > 0.05 \) vs. Rest). **CONCLUSIONS:** Skeletal muscle ACSL1 and ACSL6 protein content were positively associated with measures of whole-body fat oxidation during exercise and skeletal muscle TAG content, respectively. We interpret our results to indicate ACSLs may be critical regulators of partitioning of fatty acids within skeletal muscle, but protein content was not altered in the hours after acute exercise in sedentary lean adults.

Supported by ACSM Foundation Doctoral Student Research Grant

---

### 3693 Board #10

**Adiposity And Cardiovascular Health And The Reallocation Of Waking Activities in Preschool Children With Overweight**

Erin E. Dooley1, Kelley Petite Gabriel, FACSFM, Courtney E. Byrd-Williams1, Harold W. Kohl, III, FACSFM1, Casey P. Durand1, Deanna M. Hoelscher1. 1National Cancer Institute, Bethesda, MD. 2The University of Alabama at Birmingham, School of Public Health, Birmingham, AL. 3The University of Texas Health Science Center (UTHealth) School of Public Health in Austin, Austin, TX. 4The University of Texas Health Science Center (UTHealth) School of Public Health in Houston, Houston, TX.

Email: erin.dooley2@nih.gov

(No relevant relations reported)

Physical activity and sedentary behaviors differentially relate to health outcomes in children. Isotemporal substitution provides opportunities to evaluate the relation of hypothetical time replacement scenarios across intensity categories with health. Few isotemporal studies have been conducted among preschool-aged youth and ethnically diverse populations.

**PURPOSE:** To examine the relation of reallocation of waking activity behaviors on 1) adiposity and 2) cardiovascular health indicators among preschool-aged youth (ages 2-5 years) with overweight participating in Texas Childhood Obesity Research Demonstration (TX CORD), a low-income, majority Hispanic cohort.

**METHODS:** Participants wore an ActiGraph wGT3X-BT monitor (waist) and attended health assessments. Valid wear time was defined as ≥10 hours between 06:00-22:59 hours on ≥3 days (≥1 weekend). Adiposity measures were percentage of the 95th percentile (%BMI
_\text{95}\text{th}^{\text{}}\text{percentile}\), fat mass, fat mass index, waist circumference, and waist-to-hip ratio. Cardiovascular measures were resting systolic (SBP) and diastolic (DBP) blood pressure, and heart rate. Covariates included age, sex, ethnicity, and socioeconomic status. Isotemporal substitution modeling was employed to address the study purpose.

**RESULTS:** Complete data were available for 131 children (Mean age = 4.3±1.1, 53% female, 87% Hispanic, 31% ≤49% income to poverty ratio). For boys, reallocating 15 minutes of sedentary, light, or moderate intensity activity to vigorous intensity activity was significantly associated with beneficial reductions in all adiposity indicators; for girls, these relations were statistically null. For boys and girls, reallocating 15 minutes of sedentary (≥50 SBP, ≥3.7 DBP), light (4.3 SBP, ≥3.2 DBP), or moderate intensity activity (≥7.3 SBP, ≥5.5 DBP) to vigorous intensity activity was significantly associated with favorable cardiovascular indicators.

**CONCLUSIONS:** Substituting vigorous for lower intensity physical activity is associated with several favorable adiposity and cardiovascular health outcomes among preschool children with overweight and obesity. Teaching caregivers how to engage young children in vigorous intensity is needed, especially as overweight children spend more time sedentary and less time in higher intensity activities.
15 minutes of early morning PA of walking or running to reach an outdoor Sunrise viewing location. The participant then captured a photo of the beautiful view of nature during sunrise on their smartphone camera upon completion of their PA. The participant then instantly published the photo on a social media page. RESULTS: The individual participant self-reported increased energy, better sleep and increased productivity. The virtual participants (n=281) showed positive acceptance via social media with regular sunrise photo likes. The positive reaction to the Sunrise photo also motivated the individual to establish the daily wellness habit. The positive experience of watching sunrise and the picturesque photos of nature during sunrise were used as motivational tools. The participant’s motivation was used as a primary outcome measure and was reportedly improved upon successful completion of this study. The study also showed the influence of unique sunrise photos for emotional benefits and positive behaviour change. CONCLUSION: Our smartphone-enabled study suggested that use of technology to record unique picturesque outdoors during the sunrise can provide meaningful motivation for outdoor physical activity.

3698 Board #15
Clinical Benefit Of Cntx-4975 Intra-articular Injection For Moderate To Severe Osteoarthritis Knee Pain
Randall M. Stevens1, Peter D. Hanson1, Paul Tiseo1, Kimberly Guedes1, James N. Campbell1, James Connolly1, Stephanie Ruggiero1, Meg Corfiss1, Valerie H. Smith1, Andrew I. Spitzer2. 
Centrexion Therapeutics Corp. Other (please describe); Funding for this abstract sponsored by Centrexion Therapeutics Corp.

Purpose: To evaluate the effect of CNTX-4975 intra-articular (IA) injection on pain, function, and quality of life (QoL) in subjects with knee osteoarthritis (OA). Methods: A phase 3, open-label, 8-wk study (NCT03661996) enrolled subjects aged 40–95 y with stable, moderate to severe OA knee pain in the index knee (average pain 24 h after ≥2 failed therapies. Subjects were assigned to unilateral/bilateral CNTX-4975 1 mg IA injections as determined by OA pain/joint replacement status (Table) and randomized by site to 1 of 5 joint cooling/injection regimens to evaluate procedure experience. The circumferential joint cooling wrap used in the phase 2 pivotal trial was compared with 4 circumferential gel-pack wrap cooling groups with varying cooling schedules/injection techniques. Outcomes assessed through wk 8 included average daily index knee pain with walking (numeric pain rating scale [NPRS], 0 [no pain] to 10 [worst pain]) and Knee Injury OA Outcomes Score (KOOS) subscales (range, 0–100; higher is improvement; Table). Least squares (LS) mean, 95% CI, and P value were calculated for change from baseline in NPRS and KOOS scores using a mixed model for repeated measures. Results: The intent-to-treat population included 848 subjects; baseline NPRS index knee pain with walking scores (mean [SD]) by subject type: A, 6.5 (1.50); B, 7.4 (1.35); C, 6.2 (1.21). By day 3, NPRS scores were significantly (P<0.0001) improved; LS mean (SE) [95% CI]: A, −3.98 (0.170 [−4.32, −3.64]); B, −4.21 (0.103 [−4.41, −4.01]); C, −3.71 (0.375 [−4.48, −2.94]). Improvement was maintained at wk 8; A, −3.48 (0.191 [−3.86, −3.10]); B, −4.02 (0.118 [−4.25, −3.79]); C, −3.52 (0.416 [−3.83, −3.27]); all P<0.0001. All KOOS subscale scores were significantly improved at wk 8 (Table). Conclusions: Subjects with moderate to severe knee OA pain showed significant clinical improvements as early as 3 days and through 8 wks post injection in knee pain, function, and QoL after a single CNTX-4975 1 mg IA injection.
### Table: KODS Scores in the Knee Joint After Single Intra-Articular Injection of CNTX-4875 1 mg for Moderate to Severe Osteoarthritis of the Knee 

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Subject Type 1: Intra-articular injection (established pain, moderate knee pain)</th>
<th>Subject Type 2: Intra-articular injection (moderate to severe pain in both knees)</th>
<th>Subject Type 3: Unilateral injection (prior non-index knee replaced)</th>
<th>Subject Type 4: Unilateral injection (prior non-index knee replaced)</th>
</tr>
</thead>
<tbody>
<tr>
<td>KOOS Pain with walking (Baseline mean (SD))</td>
<td>53.9 (20.12)</td>
<td>48.1 (16.30)</td>
<td>50.6 (19.63)</td>
<td>60.1 (19.13)</td>
</tr>
<tr>
<td>Week 6</td>
<td>160.7 (44.45)</td>
<td>273.9 (26.21)</td>
<td>264.1 (26.68)</td>
<td>254.1 (26.68)</td>
</tr>
<tr>
<td>LS Mean (SE)</td>
<td>211.1 (14.49)</td>
<td>259.9 (15.00)</td>
<td>259.3 (15.00)</td>
<td>259.3 (15.00)</td>
</tr>
<tr>
<td>95% CI</td>
<td>± 17.4 (13.7)</td>
<td>± 23.9 (13.7)</td>
<td>± 23.9 (13.7)</td>
<td>± 23.9 (13.7)</td>
</tr>
<tr>
<td>Value</td>
<td>± 0.0001</td>
<td>± 0.0001</td>
<td>± 0.0001</td>
<td>± 0.0001</td>
</tr>
<tr>
<td>KOOS subscale</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain</td>
<td>Baseline mean (SD)</td>
<td>47.9 (14.91)</td>
<td>43.5 (15.68)</td>
<td>46.8 (11.96)</td>
</tr>
<tr>
<td>Week 6</td>
<td>190.9 (19.48)</td>
<td>37.9 (22.28)</td>
<td>36.1 (20.98)</td>
<td>36.1 (20.98)</td>
</tr>
<tr>
<td>LS Mean (SE)</td>
<td>251.1 (14.88)</td>
<td>25.9 (13.57)</td>
<td>26.9 (13.57)</td>
<td>26.9 (13.57)</td>
</tr>
<tr>
<td>95% CI</td>
<td>± 19.3 (2.94)</td>
<td>± 23.8 (2.94)</td>
<td>± 14.3 (3.94)</td>
<td>± 3.90 (4.01)</td>
</tr>
<tr>
<td>Value</td>
<td>± 0.0001</td>
<td>± 0.0001</td>
<td>± 0.0001</td>
<td>± 0.0001</td>
</tr>
<tr>
<td>Other symptoms</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>52.6 (15.76)</td>
<td>47.1 (16.57)</td>
<td>53.9 (15.40)</td>
<td>53.9 (15.40)</td>
</tr>
<tr>
<td>Value</td>
<td>± 0.0001</td>
<td>± 0.0001</td>
<td>± 0.0001</td>
<td>± 0.0001</td>
</tr>
<tr>
<td>Function (Daily Living)</td>
<td>Baseline mean (SD)</td>
<td>13.5 (10.49)</td>
<td>23.2 (21.21)</td>
<td>16.6 (19.26)</td>
</tr>
<tr>
<td>Week 6</td>
<td>17.2 (1.40)</td>
<td>20.5 (8.92)</td>
<td>20.4 (8.92)</td>
<td>11.4 (14.29)</td>
</tr>
<tr>
<td>LS Mean (SE)</td>
<td>14.4 (1.99)</td>
<td>15.3 (2.08)</td>
<td>15.3 (2.08)</td>
<td>11.4 (14.29)</td>
</tr>
<tr>
<td>95% CI</td>
<td>± 13.5 (1.70)</td>
<td>± 14.3 (2.00)</td>
<td>± 14.3 (2.00)</td>
<td>± 14.3 (2.00)</td>
</tr>
<tr>
<td>Value</td>
<td>± 0.0001</td>
<td>± 0.0001</td>
<td>± 0.0001</td>
<td>± 0.0001</td>
</tr>
<tr>
<td>Function (Sports and Recreation)</td>
<td>Baseline mean (SD)</td>
<td>52.2 (14.92)</td>
<td>46.6 (14.13)</td>
<td>49.8 (14.22)</td>
</tr>
<tr>
<td>Week 6</td>
<td>10.3 (1.70)</td>
<td>19.8 (3.86)</td>
<td>25.1 (4.97)</td>
<td>11.4 (14.29)</td>
</tr>
<tr>
<td>LS Mean (SE)</td>
<td>17.3 (2.05)</td>
<td>23.3 (2.07)</td>
<td>25.3 (2.07)</td>
<td>11.4 (14.29)</td>
</tr>
<tr>
<td>95% CI</td>
<td>± 5.2 (0.00)</td>
<td>± 0.0001</td>
<td>± 0.0001</td>
<td>± 0.0001</td>
</tr>
<tr>
<td>Quality of life</td>
<td>Baseline mean (SD)</td>
<td>32.4 (6.15)</td>
<td>31.6 (7.19)</td>
<td>35.9 (15.76)</td>
</tr>
<tr>
<td>Week 6</td>
<td>17.6 (2.42)</td>
<td>25.7 (26.21)</td>
<td>18.5 (26.47)</td>
<td>25.7 (26.21)</td>
</tr>
<tr>
<td>LS Mean (SE)</td>
<td>22.1 (1.96)</td>
<td>21.6 (1.65)</td>
<td>18.9 (26.25)</td>
<td>21.6 (1.65)</td>
</tr>
<tr>
<td>95% CI</td>
<td>± 15.4 (2.55)</td>
<td>± 14.3 (2.55)</td>
<td>± 8.3 (2.57)</td>
<td>± 8.3 (2.57)</td>
</tr>
<tr>
<td>Value</td>
<td>± 0.0001</td>
<td>± 0.0001</td>
<td>± 0.0001</td>
<td>± 0.0001</td>
</tr>
</tbody>
</table>

**PURPOSE:** Synovitis is common in osteoarthritis of the knee (OAK) and is associated with pain and disease severity. This open-label phase 3b study is evaluating the effect of an intra-articular (IA) injection of triamcinolone acetonide extended release (TA-ER) on synovial tissue volume (STV), pain, and function (NCT03529942). A prespecified analysis of the primary endpoint is reported.

**METHODS:** STV was determined using gadolinium-enhanced synovitis was defined as pre-treatment STV ≥3000 mm³ (3 ml). All patients (pts) received TA-ER 32 mg at baseline (BL) and were assessed at Weeks 6, 12, 18, and 24. MRIs were repeated at Weeks 6 and 24. Interim analysis was performed for the primary efficacy endpoint, mean standardized change from BL in STV at 6 weeks. Planned enrollment was based on earlier studies.

**RESULTS:** We enrolled 116 OAK pts with typical OA characteristics (Table). 89 (77%) demonstrated synovitis at BL. STV was significantly reduced from BL at 6 weeks (P<0.001, Fig 1A). The primary endpoint was met: standardized least squares mean change in STV was −1.13 (95% CI, −1.35 to −0.91; P<0.001). Western Ontario and McMaster Universities Osteoarthritis Index (pain) was significantly reduced in 6 weeks in all pts (Fig 1B). 24 (20.7%) pts experienced ≥1 treatment-emergent adverse event (TEAE); 6 (5.2%) pts had ≥1 index-knee TEAE. All TEAEs were mild or moderate; none were treatment related.

**CONCLUSIONS:** At 6 weeks, a single TA-ER IA injection markedly reduced STV in pts with synovitis at BL. Marked symptomatic improvement was observed in all pts at 6 weeks following TA-ER.
traditional exercise. This study was conducted to answer the important question, “Can high-intensity interval training (HIIT) improve CRF for prior non-responders?” METHODS: Participants were 8 (5 women, mean age 54) prior non-responders from the CardioRACE study who were at high-risk of cardiovascular disease including 35-70 years old with overweight/obesity and elevated/stage 1 hypertension. They previously participated in CardioRACE traditional continuous aerobic exercise for 3 times/week, 60 min/session, at 50-80% heart rate reserve [HRR]). They were identified as non-responders due to no or minimal increase in CRF (similar to <5% CRF increase) after 6 months of exercise, following the non-responder definition that considers technical errors in CRF assessment and day-to-day variability. In this study, participants performed HIIT exercise 3 times/week, 30 min/session for 1 month, containing four 4-min high-intensity intervals at 85-95% HRR separated by three 3-min active recovery at 40-60% HRR with 5-min warm-up and cool-down. CRF was measured by maximal treadmill test using a Balke protocol. RESULTS: This short HIIT exercise significantly improved CRF with a mean increase of 8% from 26.7 ± 28.8 to 28.8 ± 10.3 ml/kg/min (p < 0.01 from paired t-test) in prior non-responders to traditional exercise (Figure 1). All participants improved CRF and 6 became responders. All high-risk participants safely completed HIIT with 100% attendance rate without adverse events. CONCLUSION: Even half the HIIT exercise time (30 min/session) over 1 month significantly improved CRF in prior non-responders. A long-term HIIT trial with a control group is necessary to confirm the findings. CardioRACE was supported by NIH Grant R01HL133069.

Undergoing general anaesthetic and complex surgery is associated with significant risk. Compounding this, reduced muscle mass is proven to be linked to increased post-operative complications and increased length of stay. Exercise focused prehabilitation research is emergent and increasingly supportive of preventive strategies to improve post-surgical outcomes. PURPOSE: To investigate the role of a multi-site strength focused exercise intervention in improving patient condition prior to surgery to enhance recovery. METHODS: 43 (26 male, 17 females; 68.3 ± 9.3 years) patients scheduled for surgery were randomly assigned to one of two groups; 1) prehabilitation [pre-surgery exercise] 2) prehabilitation + rehabilitation [pre and post-surgery exercise] or 3) usual care. The exercise program consisted of an aerobic component and 6 resistance exercises targeting the major muscle groups. Primary outcomes were length of stay (days) and post-operative complications. Secondary measures included; whole body resistance, muscle strength, aerobic fitness, physical function and quality of life. RESULTS: There was no difference in length of stay between groups (prehab: 11.2±10.3; prehab+rehab: 13.2±6.2; control: 13.9±12.4). No differences were observed between groups for whole body resistance, aerobic fitness, measures of physical function or self-reported quality of life. CONCLUSION: The preliminary results of this study indicate resistance-based exercise training prior to and following surgery results in greater muscular strength and enhanced quality of recovery compared to current standard care practices. These findings provide promising support for the development of future strength focused prehabilitation programs to improve patient function prior to surgery and reduce the surgery stress response, promoting an accelerated recovery. Supported by WA Cancer and Palliative Care Network NMIHS20193593; Spinnaker Medical Research Foundation.
Following an Anterior Cruciate Ligament (ACL) reconstruction, females have worse functional outcomes; however, skeletal muscle biology has preferentially been studied in males. Muscle adaptation and recovery from injury are intimately tied to the muscle capillary network, which delivers oxygen, nutrients, and hormones to muscle fibers.

**Purpose**: To examine differences in skeletal muscle angiogenic signaling and capillary supply in males and females after ACL injury. **METHODS**: Vastus lateralis (VL) biopsies were collected (24.6 ± 5.5 yr; 8M, 5F) from the ACL injured (INJ) and non-injured (NI) leg before reconstruction. Samples were assessed for vascular endothelial growth factor receptor 1 and 2 (VEGFR1 and VEGFR2) by western blot. Capillary to fiber ratio (C:F), capillary to fiber perimeter exchange index (CFPE), and capillary tortuosity (% fiber border directly contacting capillary wall) were assessed by immunohistochemistry. **RESULTS**: The percentage of phosphorylated relative to total VEGFR2 was not different between INJ and NI, but was lower in females (76.9 ± 4.1%) compared to males (89.2 ± 3.2%; P = 0.043). VEGFR2 abundance tended to be higher (P = 0.098) and C:F was lower (INJ: 2.3 ± 0.2 capillary/fiber, NI: 2.6 ± 0.2 capillary/fiber; P = 0.018) in INJ compared to NI, but neither parameter was different between sexes. VEGFR1 abundance displayed a sex by injury interaction (P = 0.004), with females having greater abundance of VEGFR1 in INJ (584 ± 54 A.U.) compared to NI (478 ± 53 A.U.; P = 0.050), while males showed the opposite (NI: 461 ± 42 A.U.; INJ: 383 ± 42 A.U.). CFPE was lower in INJ compared to NI (INJ: 5.1 ± 0.3 capillary•fiber, NI: 5.8 ± 0.3 capillary•fiber; P = 0.002), and post-hoc analysis revealed that the difference was driven by females. Capillary tortuosity was lower in INJ (13 ± 2%) compared to NI (17 ± 2%) for females only (P = 0.006). **CONCLUSION**: Differences in angiogenic signaling between males and females in both INJ and NI limbs were evident, and ACL injury resulted in an exacerbated deficit in muscle capillary supply for females. These results support the idea that sex-specific differences in VL capillary network remodeling following ACL injury contribute to different functional outcomes following reconstruction and rehabilitation. Supported by NIH grants: R01 AR072061 and K23 AR062069.

Tumor blood vessels pose obstacles for drug delivery because they are hyper-permeable and non-functional. There is a critical need to identify safe methods to increase chemotherapy delivery to the tumor. **Purpose**: We demonstrated that aerobic exercise improves tumor vasculature function, in multiple disparate tumor models, caused increasing chemotherapy delivery and efficacy in mice. Across models, exercise reduced tumor vessel permeability. Because aerobic exercise increases blood flow both in healthy and tumor vessels, we aimed to investigate shear stress responsive mechanisms by which exercise may reduce tumor vessel permeability. **Methods**: In vivo approaches including pharmacologic agents, a forced treadmill model of moderate aerobic exercise, and transgenic mouse models were utilized in combination with in vitro modeling of exercise induced shear stress, using a cone and plate viscometer. **Results**: In tumor endothelium, we found the flow responsive kinase and co-transcriptional activator extracellular signal-regulated kinase 5 (ERK5) regulates tumor vessel permeability, similar to exercise. ERK5 activation in response to exercise was investigated in vivo, using a Krippel like factor 2 (KLF2) reporter mouse. KLF2 is a well-defined downstream target of ERK5. KLF2 was upregulated by exercise in the lung and aorta endothelium providing the first evidence for the involvement of ERK5 activation in response to aerobic exercise. Based on this and our previous data demonstrating that exercise induced shear stress upregulates spongosine-1 phosphate receptor 1 (SIPR1) on tumor vessels, we hypothesized that exercise activates ERK5, causing SIPR1 upregulation and decreasing permeability in tumor endothelium. To investigate this, we modeled basal tumor vasculature (low shear stress, 3 dynes/cm²) and exercise-induced flow (high shear stress, 15 dynes/cm²) with a cone and plate viscometer in vitro. We found the ERK5 axis has a similar flow responsive pattern as SIPR1. Further, ERK5 directly regulates SIPR1 in cultured endothelial cells revealing a novel EC pathway, the ERK5-SIPR1 axis. **Conclusion**: In summary, our data identifies the ERK5-SIPR1 axis as a potential exercise responsive pathway in tumor and healthy vasculature. We are currently investigating activation of the ERK5 axis in tumor vasculature.
3708 Board #25

Associations Between Physical Activity, Quality Of Life And Emotional Well-being During Active Surveillance For Prostate Cancer

Efthimios Papadopoulos1, Shabhir M.H. Alibhai2, Isabelle Dore3, Andrew Matthew4, George Tomlinson5, Michael Nesbitt6, Antonio Finelli7, John Trachtenberg8, Daniel Santa Mina9.
1University of Toronto, Toronto, ON, Canada. 2University of Health Network, Toronto, ON, Canada. 3University of Montreal, Montréal, QC, Canada. Email: efthimios.papadopoulos@mail.utoronto.ca

NO ABSTRACT

PURPOSE: The purpose of this retrospective longitudinal study was to examine the association between post-diagnosis physical activity (PA), and the change in quality of life (QoL) and emotional well-being over time in men on active surveillance (AS) for low-risk prostate cancer.METHODS: Our analysis included 630 participants from AS initiation until AS discontinuation or loss to follow up. A modified Godin Leisure-Time Exercise Questionnaire was used to measure post-diagnosis PA in metabolic equivalent-minutes per week (MET-min/wk). Participants were categorized based on their PA levels: inactive (<210 MET-min/wk), insufficiently active (210-499 MET-min/wk), active (500-1000 MET-min/wk), and highly active (>1000 MET-min/wk). QoL and emotional well-being were assessed by the Patient-Oriented Prostate Utility Scale. The association between post-diagnosis PA (independent variable) and emotional well-being (dependent variable) was assessed using generalized estimated equations (GEE). GEEs were also used to determine the association between PA (independent variable) and emotional well-being (dependent variable). All models adjusted for patient’s age. RESULTS: Compared to inactive participants, active (OR=4.41; 95%CI: 0.25, 7.92) and highly active (OR=4.96; 1.54, 14.87) participants had higher QoL and emotional well-being over time (OR = 2.17; 95%CI = 1.06, 4.46, p = 0.034) relative to lowest PA (<210 MET-min/wk). CONCLUSIONS: Our findings emphasize the importance of PA as a supportive care strategy during AS for low-risk prostate cancer.

3709 Board #26

Reliability Of The Athlete Diet Index: A Rapid Dietary Assessment Tool For Athletes

Louise Capling1, Janelle A. Gifford2, Victoria M. Flood3, Kathryn L. Beck4, Fiona Halar2, Gary J. Slater5, Helen T. O’Connor6. 1The University of Sydney, Lidcombe, NSW, Australia and Queensland Academy of Sport, Nathan, QLD, Australia. 2The University of Sydney, Lidcombe, NSW, Australia. 3The University of Sydney, Lidcombe, NSW, Australia and Western Sydney Local Health District, Westmead, NSW, Australia. 4Massey University, Auckland, New Zealand. 5University of the Sunshine Coast, Maroochydore, QLD, Australia and Australian Institute of Sport, Bruce, ACT, Australia.
Email: acap7726@uni.sydney.edu.au

NO ABSTRACT

Diet quality indices are a practical and inexpensive way to evaluate dietary patterns and adherence to nutrition guidelines. While the diet quality of athletes has been reported using population indices, there is currently no reliable athlete-specific diet index with a comprehensive list of items, and incorporating an adverse diet index (ADI) was specifically designed to aggregate the items that would be most prevalent in athletes, providing practitioners with a promising measure of usual dietary intake. Further evaluation of the ADI, including validation compared to established dietary methodology, is warranted.

3710 Board #27

Abstract Withdrawn

3711 Board #28

Effects Of Mitochondria-targeted Antioxidant Supplementation On The Transcriptional Response To Exercise And Cycling Performance

Sophie C. Broome1, Andrea Braakhuis2, Cameron J. Mitchell3, Troy L. Merry4. 1University of Auckland, Auckland, New Zealand. 2University of British Columbia, Vancouver, BC, Canada.
Email: s.broome@auckland.ac.nz

NO ABSTRACT

Oral supplementation with general antioxidants has little impact on performance and, in some cases, interferes with training-induced adaptations that improve performance. This may be attributed to the non-specific nature of most antioxidant supplements. Mitochondria-targeted antioxidants are becoming popular amongst active individuals as they are specifically designed to accumulate within the mitochondria to provide more targeted protection against oxidative damage. The aim of this research was to investigate the effect of Mitofenon (MitoQ) on the transcriptional response to high intensity interval exercise (HIIE) and hill training (HIIT) – induced changes in performance and cycling performance in trained cyclists. To understand how MitoQ supplementation during training affects the transcriptional response to HIIE and HIIT-induced changes in performance, twenty-three untrained middle-aged (age 44 ± 8 years) men were randomised to receive MitoQ (20 mg/d) or a placebo for 6 weeks before completing a performance test (cycling at 70% VO2 peak) and the placebo for 6 weeks before completing a performance test (cycling at 70% VO2 peak for 45 min followed by an 8 km time trial). In untrained men, expression of peroxisome proliferator-activated receptor gamma coactivator 1-alpha (PGC1-α) was increased 3 hr after HIIE and this effect was increased by MitoQ (Cohen’s d = 0.89). While VO2 peak and 20 km time trial performance improved similarly in the MitoQ and placebo group after HIIT, the improvement in peak power output (PPO) achieved during the VO2 peak test was greater in the MitoQ group (by 5.8%, p<0.03). MitoQ also significantly improved 8 km time trial performance in trained cyclists. These results suggest that MitoQ may augment exercise-induced increases in PGC1α expression and improve cycling performance when taken during exercise training.

3712 Board #29

Fit And Fast Versus Slow And Steady: The Relationship Between Fitness And Cognitive Performance In Males And Females

Email: r.hopman@northeastern.edu

NO ABSTRACT

PURPOSE: Previous research shows aerobic fitness influences attentional inhibition. However, few studies have reported a differential relationship between aerobic fitness and inhibition between males and females. This study investigated the relationship between fitness and inhibitory performance in college-aged males and females.

METHODS: Seventy-nine young adults (M: 19.90 ± 1.1 yrs; 48 females) completed measurements of physical fitness (VO2 max test) and inhibitory control (modified flanker task). Moderation analyses were conducted to determine the influence of sex on the relationship between aerobic fitness and inhibitory control. RESULTS: RT, response accuracy, and percentage of commission errors were regressed against mean-centered fitness (VO2max percentiles), sex, and the interaction between fitness and sex. Fitness was significantly correlated with congruent accuracy (p = 0.05), but not correlated with incongruent accuracy (p = NS) or RT (p = NS). Fitness was negatively correlated with total commission errors (p = NS). The interaction between fitness and sex revealed males who are more fit are faster in both congruent (p < 0.05) and incongruent responses (p = 0.05), whereas fitter females are slower in both congruent (p < 0.05) and incongruent responses (p = 0.05).
Interestingly, fitter males are significantly less accurate during incongruent trials (p < 0.005), whereas females did not differ in accuracy based on fitness (p = NS). Neither males nor females showed improvement in accuracy based on fitness for congruent trials. Similarly, fitter males have a greater percentage of incongruent commission errors (p < 0.005) but no differences in congruent commission errors (p = NS), whereas in females, fitness did not influence percentage of congruent (p = NS) or incongruent commission errors (p = NS).

CONCLUSIONS: These results suggest that aerobic fitness may differentially influence flanker performance, particularly in the more challenging condition, in males and females. Furthermore, males and females may adopt different strategies in the difficult condition to maintain performance. These results suggest that while higher fit males may slow down in order to maintain accuracy, higher fit males may have faster responses at the expense of errors.

Extensive research supports the use of exercise to protect against Alzheimer’s disease (AD). Nevertheless, there is limited evidence from human studies regarding the mechanisms underlying the positive effects of exercise on the brain. Gene expression (AD). Nevertheless, there is limited evidence from human studies regarding the impact of exercise on AD-related gene expression has not yet been studied in humans.

METHODS: To examine changes in AD-related gene expression following a six-month high-intensity exercise intervention.

METHODS: Cognitively normal men and women (60-80y) were randomised to either six-months of work-matched high-intensity exercise (n=33), moderate-intensity exercise (n=34) or an inactive control group (n=32). Blood samples were collected pre- and post-intervention and expression levels of a panel of genes implicated in AD were measured. Analysis of covariation (covariated for age and gender), with adjustment for multiple comparisons, was conducted to determine group differences. RESULTS: Decreases in AD-related gene expression following six months of exercise, compared with the control group. More specifically, gene expression associated with cholesterol metabolism (ABC1A; p < 0.001), amyloid precursor protein processing (ADAM17, BACE1; p < 0.05) and synaptic plasticity (UCHL1; p < 0.001) was favorably altered in the high-intensity intervention, compared with the moderate-intensity intervention and control groups. CONCLUSIONS: Investigation of AD-related gene expression has the potential to play an important role in understanding the biological pathways by which exercise reduces AD risk and contributes to enhanced cognitive health. The current work indicates a dose-dependent effect of exercise intensity on the expression of genes associated with AD, revealing mechanistic pathways that require further investigation.

Exertional heat stroke (EHS) represents a significant source of morbidity and mortality for the military and other occupational and athletic populations. EHS patients tend to present with elevated biomarkers of acute liver and kidney injury, rhabdomyolysis, and altered hematological parameters. However, little is known about how men and women may respond differently to EHS, in terms of clinical severity and/or biochemical responses. PURPOSE: The aim of this study was to characterize clinical and biochemical differences between male and female servicemembers immediately following an EHS episode.

METHODS: We performed a retrospective analysis of EHS patient records in all US military personnel (41% between 20-24 years old) from 2008-2014 using the Military Health Systems Data Repository. We compared diagnoses of organ failure during the course of treatment and clinical laboratory markers of end organ damage. Sex differences in clinical outcomes are presented with odds ratios, and biomarker differences are presented as the median difference with 95% confidence intervals in brackets. RESULTS: A total of 2,529 EHS cases were recorded with 9.8% [8.7, 11.2] occurring in women. On patient treatment cost was lower in women by $1110 [620, 1647]. Men were 2.35 [1.6, 3.58] times more likely to experience renal failure (p < .001). Blood urea nitrogen, (difference = -121.05 mg/dL [41.9, 182.28]), myoglobin (difference = 3 ng/mL [2, 4]), aspartate transaminase (difference = 7 units/L [1, 14]), and alanine transaminase (difference = 13 units/L [8.5, 15.92]) were elevated in men (all p < .01). Platelet count was also lower in men compared to women (difference = -22.1410^6 per ul [59.25, -2.99], p = 0.03). CONCLUSION: Female servicemembers appear to have a slightly less severe response to EHS compared to their male counterparts. In particular, renal failure was more common, and numerous markers of end-organ damage (hepatic, renal, and cardiovascular) were more likely to be elevated immediately following EHS in men. Supported by USAMRDC; author views not official US Army or DoD policy.

PURPOSE: The present study examined the relationship between body composition and sport-specific performance markers in NCAA Division I female volleyball players. METHODS: Twelve NCAA DI female volleyball players were assessed for body composition [body mass (BM), fat mass (FM), fat-free mass (FFM), body fat % (BF%)] via air displacement plethysmography (BODPOD) and sport-specific performance metrics [standing vertical jump (SVJ), pull-ups (PU), power clean (PC), back squat (BS), bench press (BP), and 5-10-5 pro agility shuttle (PA)] pre-, mid-, and post-season. Pearson and partial correlations assessed the relationship between body composition, BMI, FFM, and performance metrics. RESULTS: FM and FFM were highly correlated (r=0.521, p<0.01). FM and PC were correlated (r=0.405, p=0.01) when assessed via Pearson correlation but no longer correlated when controlling for FFM (partial correlation, r=0.384, p=0.05). FM and SVJ were correlated when controlling for FFM (r=0.477, p=0.01). FFM was correlated (Pearson, p<0.05) with BP (p=0.335), PC (r=0.748), SVJ (r=0.659), and PA (r=-0.373). When controlling for FM, partial correlations (r=0.03) existed between FFM and PC (r=0.653), SVJ (r=0.707), and PA (r=-0.407). CONCLUSION: SVJ was the only performance variable that correlated
with FM when controlling for FFM. FFM was positively correlated with PC and SVJ, and negatively with PA when controlling for FM. This suggests greater amounts of FM are more advantageous for performance in the PC (lift greater amounts of weight and PA (perform in less time) than having low FM, while having low FM or greater FFM are both advantageous for SVJ (greater jump height).

3717 Board #34
Validity And Reliability Of A Portable Metabolic Analyzer For Assessing Oxygen Consumption And Ventilation
Joseph D. Vondracek, James B. Hancock, II, Alexander H.K. Montoye, FACSM. Alma College, Alma, MI.
(No relevant relations reported)

Metabolic analyzers are standard tools in research-based, exercise physiology laboratories in university settings. Portable, low-cost metabolic analyzers have the capacity to extend the value of metabolic gas analysis beyond the traditional laboratory setting. PURPOSE: This study’s purpose was to assess validity and reliability of a portable, low-cost metabolic analyzer (VPRO) for assessment of oxygen consumption (VO2) and minute ventilation (VE) during progressive cycling testing. METHODS: In Protocol 1, eight male participants (height: 171.9 ± 5.8 cm, weight: 79.6 ± 8.3 kg, age: 41.0 ± 12.3 years) with previous competitive cycling experience ranging from 2-40 years completed an hour-long stationary cycling protocol twice, progressing from 100-300 Watts every 10-12 minutes while wearing the VPRO and a criterion measurement (PMED) for five minutes each, at each stage. In Protocol 2, 16 recreationally active male participants (height: 168.2 ± 8.4 cm, weight: 76.5 ± 13.3 kg, age: 23.0 ± 9.4 years) completed three incremental, maximal stationary cycling tests wearing one of three analyzers for each test (VPRO version 1.1, VPRO version 1.2.1, PMED). Mean absolute percent differences (MAPD) ≤10% were deemed acceptable validity/ reliability. RESULTS: For Protocol 1 and convergent validity, the VPRO had mean absolute differences from the PMED of 9.1±8.8% for VO2 overall and 9.7±7.9% for VE overall and at each exercise stage. MAPD for VO2 and VE were <9% overall and <10% at each exercise stage. Test-retest reliability of VO2 and VE of the VPRO (MAPD: 8.9-11.0%) was lower than the PMED (MAPD: 4.7-7.6%). For Protocol 2, absolute differences from the PMED of <0.3 L/min for absolute VO2 and <5 L/min for VE overall and at each exercise stage. Test-retest reliability of VO2 and VE of the VPRO were <9% overall and <12% at each exercise stage. Test-retest reliability of VO2 and VE of the VPRO were <9% overall and <12% at each exercise stage. CONCLUSION: The VPRO had acceptable validity and test-retest reliability for most variables and intensities tested and may be an appealing option for VO2 and VE analysis.

3718 Board #35
The Effects Of Acute Resistance Exercise On Bioelectrical Impedance Analysis Measures Of Body Composition
Timothy Berreth1, Rachel Wong1, John Barker1, Robert Fox1, Megan Maldonado1, Chase Van Cleve1, Javier Zaragoza2, Mathias Tinnin1, Grant Tinsley2, Len Taylor, FACSM,3 Kindyle Brennan1, 1University of Mary Hardin-Baylor, Belton, TX. 2Texas Tech University, Lubbock, TX. Email: tberreth@mail.umbh.edu
(No relevant relations reported)

PURPOSE: The purpose of this study was to determine if acute, localized resistance exercise disrupts the validity of DXA total body composition estimates. METHODS: In a crossover design, 18 healthy, resistance-trained, college-aged adults, including 7 females (age: 22.7 ± 1.9 y; height: 165.4 ± 8.4 cm; body mass: 62.1 ± 10.9 kg; body fat: 25.9 ± 7.3%) and 11 males (age: 24.2 ± 4.1 y; height: 180.0 ± 5.1 cm; body mass: 90.2 ± 9.5 kg; body fat: 18.7 ± 7.2%) completed three conditions in a randomized order: lower-body resistance exercise (RELOWER), upper-body resistance exercise (REUPPER), and rest (REST). The resistance exercise (RE) protocol consisted of a RE warm-up consisting of 2 sets of 12-15 repetitions of 3 upper-body exercises (upper), 3 lower-body exercises (lower) or nothing (rest). The RE circuit consisted of 5 sets of 10 repetitions per exercise, with 1-minute rest intervals between circuits. A DXA scan was performed immediately before exercise and at 60 minutes post exercise. DXA estimates of fat mass (FM) and fat-free mass (FFM; calculated as lean soft tissue plus bone mineral content) were analyzed using 3 x 2 (condition x time) analysis of variance with repeated measures, follow-up pairwise comparisons, and evaluation of the partial eta-squared (η2) effect sizes. RESULTS: Pre-exercise FM and FFM did not differ between conditions (0.2 ± 0.4 kg; p > 0.14 for all). For FM, no statistically significant interaction or main effects were present (interaction: p = 0.80, η2 = 0.01; time main effect: p = 0.14, η2 = 0.12; condition main effect: p = 0.92, η2 = 0.01). For FFM, no statistically significant interaction (p = 0.13, η2 = 0.012) or condition main effect (p = 0.95, η2 = 0.03) was present. However, a statistically significant time main effect was present (p = 0.009, η2 = 0.34). Pairwise comparisons indicated that post-condition FFM estimates were 0.20 ± 0.07 kg lower than pre-condition values in all conditions combined. CONCLUSIONS: No differences were seen among conditions, indicating that DXA total body composition estimates may be relatively robust to the effects of acute, localized RE. However, investigation of segmental estimates is warranted due to RE-induced blood flow redistribution.

3719 Board #36
The Effects Of Acute Resistance Exercise On Dual-Energy X-Ray Absorptiometry Measures Of Body Composition
Robert Fox1, John Barker1, Timothy Berreth1, Megan Maldonado1, Chase Van Cleve1, Rachel Wong1, Javier Zaragoza2, Mathias Tinnin1, Grant Tinsley2, Len Taylor, FACSM,3 KIndyle Brennan1, 1University of Mary Hardin-Baylor, Belton, TX. 2Texas Tech University, Lubbock, TX. Email: rjfox@mail.umbh.edu
(No relevant relations reported)

PURPOSE: The purpose of this study was to determine if acute, localized resistance exercise disrupts the validity of BIA total body composition estimates. METHODS: In a crossover design, 18 healthy, resistance-trained, college-aged adults, including 7 females (age: 22.7 ± 1.9 y; height: 165.4 ± 8.4 cm; body mass: 62.1 ± 10.9 kg; body fat: 25.9 ± 7.3%) and 11 males (age: 24.2 ± 4.1 y; height: 180.0 ± 5.1 cm; body mass: 90.2 ± 9.5 kg; body fat: 18.7 ± 7.2%) completed three conditions in a randomized order: lower-body resistance exercise (RELOWER), upper-body resistance exercise (REUPPER), and rest (REST). The resistance exercise (RE) protocol consisted of a RE warm-up consisting of 2 sets of 12-15 repetitions of 3 upper-body exercises (upper), 3 lower-body exercises (lower) or nothing (rest). The RE circuit consisted of 5 sets of 10 repetitions per exercise, with 1-minute rest intervals between circuits. A DXA scan was performed immediately before exercise and at 60 minutes post exercise. DXA estimates of fat mass (FM) and fat-free mass (FFM; calculated as lean soft tissue plus bone mineral content) were analyzed using 3 x 2 (condition x time) analysis of variance with repeated measures, follow-up pairwise comparisons, and evaluation of the partial eta-squared (η2) effect sizes. RESULTS: Pre-exercise FM and FFM did not differ between conditions (0.2 ± 0.4 kg; p > 0.14 for all). For FM, no statistically significant interaction or main effects were present (interaction: p = 0.80, η2 = 0.01; time main effect: p = 0.14, η2 = 0.12; condition main effect: p = 0.92, η2 = 0.01). For FFM, no statistically significant interaction (p = 0.13, η2 = 0.012) or condition main effect (p = 0.95, η2 = 0.03) was present. However, a statistically significant time main effect was present (p = 0.009, η2 = 0.34). Pairwise comparisons indicated that post-condition FFM estimates were 0.20 ± 0.07 kg lower than pre-condition values in all conditions combined. CONCLUSIONS: No differences were seen among conditions, indicating that DXA total body composition estimates may be relatively robust to the effects of acute, localized RE. However, investigation of segmental estimates is warranted due to RE-induced blood flow redistribution.

3720 Board #37
High School Basketball Coach And Player Perspectives About Warm Up Routines And Lower Extremity Injuries
Corrine Munoz-Plaza1, Dana Pounds1, Anna Davis2, Stacy Park1, Robert Sallis, FACSM3, Adam Sharp1, 1Kaiser Permanente, Pasadena, CA. 2Kaiser Permanente, Fontana, CA. Email: corrine.munoz-plaza@kp.org
(No relevant relations reported)

PURPOSE: To understand high school basketball coach and player routines, knowledge and attitudes relating to warm-ups and lower-extremity injuries (LEIs). METHODS: A prospective qualitative study using data from semi-structured interviews with high school basketball coaches and players conducted from May-October 2019, then thematic analysis by multiple reviewers employing team auditing. RESULTS: We interviewed n=12 coaches (9 male; 3 female) and n=30 players (11 male; 19 female). Current warm-up. Coaches and players report regular engagement in warm-up routines, but the types of exercises, time dedicated (range: 5-45 minutes) and exercise order varied. Coaches often rely on players to co-lead warm-up exercises. Knowledge and beliefs re: LEI prevention research. Most coaches and players believe that regularly engaging in a warm-up routine is effective at preventing injury (“...warming up is absolutely important. There’s no disputing.”), but lack thorough knowledge of the current evidence (“I have a general interest in sports and fitness—[you] can’t give me any specific—sources.”). Barriers. Warm-up routines suffer at games due to limited time and space (“Game-time is the worst time.”). Some players and coaches perceive youth as impervious to injury and minimize warm-up (“I remember being 16 and 17: ‘[you get] out of bed and [you] just run two miles and you’re fine.’”). Coaches face multiple demands during practice, which can impede their focus on a warm-up routine (“...as a coach, [warm-up is] hard—you don’t have a lot of time—You want to get right to the point of practice...”). Coaches also expressed concern that they lack adequate knowledge to select the best exercises and skills to teach their players how to perform them correctly (“...what stretches...”)

Abstracts were prepared by the authors and printed as submitted.
CONCLUSION: Our results demonstrate that there are inherent differences in heart mtDNA damage and copy number. Interestingly, the wild-derived PWD/PhJ strain had higher overall mtDNA copies, possibly suggesting the hearts of this strain undergoes significant mitochondrial-derived oxidative stress (i.e., higher fission vs fusion; mitophagy) compared to others. Thus, ongoing work aims to (1) characterize markers of mitochondrial-derived oxidative stress (i.e., fission/fusion; mitophagy), (2) sequence the complete mitochondrial genome and determine levels of heteroplasy and indels that may associate with mtDNA damage and copy number.

**METHODS:** Participants were middle-aged normotensive AA immigrant women living in New York City. They completed measures of acculturation along with 7 days of wrist and hip actigraphy to measure sleep duration, moderate-vigorous PA (MVPA), light intensity PA (LIPA) and SB, MVPA, LIPA, and SB were classified by Freedson(1998)’s cut-points and sleep duration was identified by using the Cole-Kripke algorithm and sleep diaries. Linear regression analysis was conducted to test the associations of ethnicity (East Asian vs. South Asian) and acculturation variables (age immigrated to the U.S., years of U.S. residency, English proficiency) on 24-hour behaviors, controlling for age, BMI, education, and employment.

**RESULTS:** Of the 94 AA women enrolled, 89% (n=84) completed wrist and hip actigraphy monitoring (age=61±3.7, BMI=25±4.3, 58.9% college or higher, 54.4% employed). Their average hours spent on 24-hour behaviors were: MVPA=0.5±0.4, LIPA=6.2±1.6, SB=9.8±1.7, sleep =5.3±0.9. More daily MVPA was related to East Asian ethnicity (b=0.42, p<0.01), immigrating to the U.S. at an older age (b=0.43, P=0.01), and greater English proficiency (b=0.32, p=0.01). More SB was related to South Asian ethnicity (b=0.36, p=0.01) and longer U.S. residency (b=0.35, p=0.02). Average sleep duration was below recommendations in both East and South Asian women (5.4±0.8 vs. 5.1±0.9), but sleep duration and LIPA were not related to any of the acculturation variables. **CONCLUSIONS:** AA women’s 24-hour behaviors differed by ethnicity, and associations with some acculturation variables were observed in this study. Larger, prospective studies are needed to explore the heterogeneity in 24-hour behaviors within this growing minority group and explore both positive and negative effects of acculturation. Culturally tailored strategies may be needed to improve 24-hour behaviors and reduce CVD risk in AA women.
several of rest alternately. Exercise intensity is RPE 15-16 levels. The brain wave conditions of all subjects were presented in comparison to and after post hoc treatment procedures. We performed Two-way Repeated Measures analysis of variance (ANOVA) as the test of the difference between the before and after the program. RESULTS: First, EMS part (M = 66.73, SD = 7.23), PFN part (M = 38.02, SD = 7.23), EMS during PFN stretching part (M = 59.33, SD = 7.23) were confirmed in Alpha value. So significant differences were found between warm-up exercise with EMS during PFN-stretching (p<.01); EMS during PFN-stretching and PFN-stretching (p<.05) in Alpha value. In addition, it showed significant increases in alpha value corresponding to duration of treatments(F=4.851, p<.009). Second, significant differences between before and after were found in beta values(F=5.024, p<.026). Third, significant differences were found between EMS (M=151.99, SD=14.93) and PFN-stretching (M=84.67, SD=14.93) in theta value(p<.01). EMS showed higher value than PFN-stretching in theta wave.

CONCLUSIONS: This study was showed changes of an alpha wave, which reflects positive emotions, depending on presence of EMS. Thus, it can be considered as a more effective method when applying EMS to conventional stretching which leads athletes to feel more effectively treated. The result of the increase in the beta wave was predicted about the difference between EMS stimulation and general stretching by reflecting the characteristics of the beta wave that is activated as cognitive processing occurs. Theta wave is activated when the influence and anxiety of a quiet environment are felt. We are guessed Player thinks that the effect of stretching is low and that the result is reflected when the traditional stretching is performed. Throughout this study, athletes can be expected to show better performance by using EMS during stretching exercise.

**Experimental schematic diagram**

<table>
<thead>
<tr>
<th>pre-test EEG</th>
<th>EMS + PFN Stretching</th>
<th>PFN Stretching</th>
</tr>
</thead>
<tbody>
<tr>
<td>↓</td>
<td>10 min rest (Between measurements)</td>
<td>↓</td>
</tr>
<tr>
<td>post-test EEG</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**3725 Board #42**

The Effects Of Citrulline Malate Supplementation In Strength And Muscle Mass

Thiago Barros Estanislau1, Geovana S F Leite2, Ayane S. Resende1, Leandro R. Marques1, Antônio H. Lancha Junior2, Daniela Caetano Gonçalves1, Federal University of Sao Paulo (UNIFESP), Santos, Brazil. 1Federal University of Sao Paulo (USP), Sao Paulo, Brazil. 2Federal University of Sergipe (UFS), Sergipe, Brazil.

Email: thbstanislau@gmail.com

(No relevant results reported)

L-citrulline (CIT) is a non-essential amino acid, found abundantly in watermelon, which has the ability to indirectly increase nitric oxide production by increasing arginine levels. A combination and the acute use of CIT with malate (intermediate of the Krebs cycle) has shown interesting results in the sports science literature, but the chronic effect of citrulline malate (CM) in the scientific literature is still unclear.

PURPOSE: Investigate the chronic effects of citrulline malate supplementation in increasing strength and muscle mass in trained healthy adults.

METHODS: A randomized, double-blind, crossover, placebo clinical study. Twenty four (25.96 ± 4.7 years) healthy adult men were randomly divided into 2 groups; citrulline malate group (CM= 12; 82.41±10.7kgs) or placebo group (PL = 12; 82.11±10.9kgs). The CM group received a sachet containing 6g of citrulline malate + 15g of maltodextrin and the PL group 6g of non-essential amino acids (NAAE) + 15g of maltodextrin. Supplementation was performed for 28 days (4 weeks) and included a wash-out week. After this week, there was an exchange of supplements in both groups. Before and after each supplementation, body composition (body weight, fat mass and muscle mass) by plethysmography (BodPod), and repetition maximum test (RM) in the bench press were performed. Statistical analysis was performed using the covariance analysis model for crossover experiments, considering a significance level p<.05.

RESULTS: CM supplementation promoted an increase in total lean mass (67.28 ± 8.11kgs vs 67.77 ± 7.97kgs, p<.005) in relation to placebo (67.83 ± 7.84kgs vs 67.43 ± 8.57kgs) (CM vs PL p<.001), a decrease in total weight (CM 82.39 ± 10.72kgs vs 81.63 ± 9.98kgs and PL 82.11 ± 10.9kgs vs 82.08 ± 9.78kgs, CM vs PL p<.005) and an increase in the final bench press (CM 37.95 ± 7.6kgs vs 41.55 ± 8.31kgs, p<.05) in relation to placebo supplementation (38.26 ± 8.69kgs vs 40.08 ± 8.19kgs, p<.05) (CM vs PL p<.001), regardless of the sequence in which the supplement was ingested.

CONCLUSION: Supplementation of CM for 4 weeks proved to be effective in improve body composition (decrease in total weight and increase lean mass) and increased strength, without showing adverse effects, indicating a viable strategy for practitioners of resistance exercise.

Blood flow restriction (BFR) is a low load exercise modality advocated to improve body composition. PURPOSE: To compare BFR against high intensity interval training (HIIT) body weight squats (BWS), and 80% 1RM squats (CON) in body composition and quadriceps tendon cross-section area (QXS). METHODS: Thirteen subjects participated in the study (27±5.8 years, BMI: 23.3±3.2, F:8). Subjects were randomly assigned to a BFR (n=5), HIIT (n=5), or CON (n=3). Body composition was measured via air plethysmography while QXS was measured via musculoskeletal ultrasound. Subjects were tested at baseline and 6-weeks after training. BFR bands were placed at the proximal thigh and inflated to 250mmHg while performing a 30/15/15/15 repetition (rep) protocol using a metronome (1 rep/2 secs). The HIIT group completed BWS during a 20 sec on and 10 sec off protocol for 8 sets. The control (CON) group completed 3 sets of 5 reps squats of their 80% 1RM. All three groups completed their workouts 3 times a week. Due to the small sample size, Kruskall-Wallis (KW) was performed for the variables of fat mass (fm), lean mass (lm), and QXS (cm) during baseline. If no differences at baseline were found the same analysis was performed for the 6-week follow-up. In addition, a KW analysis between groups was performed for the differences between baseline and follow-up values between variables. RESULTS: Although BFR showed improvements (fm: -1.1kg; lm: +0.3kg; QXS: +0.1cm) for all variables over the other groups (HITT: fm: +1.5kg, lm: +2.9kg, QXS: +0.2cm; CON: fm: +0.5kg, lm: +0.4, QXS: +0.1cm) none of the two KW analytical analyses showed a statistically significant difference for any of the variables of interest. CONCLUSION: Although BFR showed improvements in all variables, the magnitude of these changes was not significant enough to demonstrate it is a superior modality than HIIT or 80% 1RM or 6-weeks of training is not sufficient time to elicit changes in these outcomes.

**3737 Board #54**

Blood Flow Restriction Compared To High Intensity Interval Training On Body Composition And Tendon Width

Justin Anderson1, Kali Morris1, Gustavo Almeida1, Julie Barnett1, Tabitha Castillo1, Amber Schneider2, Alexis Ortiz, FACSM1,

1University of Texas Health San Antonio, San Antonio, TX. 2University of The Incarnate Word, San Antonio, TX. (Sponsor: Alexis Ortiz, FACSM)

Email: andersoj16@mail.uthscsa.edu

(No relevant results reported)

Many exercise modalities are used to increase muscle strength and power output with differing load capacities. Purpose: To compare the effects of 80% 1RM (CON) squats, High Intensity Interval Training (HIIT) body weight squats, and Blood Flow Restriction (BFR) BWS on quadriceps (quads) and hamstrings (hams) strength, and power output via isokinetic testing and standing vertical jump, respectively. Methods: 13 subjects were randomly assigned to: CON, HIIT, or BFR groups. Subjects were tested on an isokinetic dynamometer at 60, 180, and 300 degrees/sec while vertical jump was performed using a vertical jump tester. The training program for the control subjects (N=3) consisted of performing 3 sets of 5 repetitions (reps) at 80% of 1RM squats. The HIIT group (N=5) completed a protocol of 20 seconds of squats followed by 10 seconds of rest for 8 sets. The BFR group (N=5) completed a protocol of 30/15/15/15 reps with 30 seconds rest between sets with bands placed on the proximal thigh bilaterally and inflated to 250 mmHg. The squats for the BFR group were performed using a metronome set to 60 bpm with each rep for 2 seconds. Due to the small sample size, Kruskal-Wallis (KW) analyses were performed for each outcome for the baseline measures, post-training measures, and the difference between post and pre training measures. Results: Although all training modalities elicit improvements for all outcomes, 80% 1RM squats showed the greatest improvement in vertical jump (+8.5cm) while HIIT was the training program showing the greatest magnitude of improvement across all isokinetic variables (average = +0.84kg m/s/2). However, none of the observed changes were statistically significant. Conclusion: It appears all
training modalities are viable for improvements in power and strength. Nevertheless, the small sample size of the study might be hiding if one modality is superior over the others.

Traditional moderate intensity continuous training increases maximal oxygen uptake (VO₂max) without aerobic training. VO₂max was increased by 2% (16.8 ± 3.5 mL/kg/min; p < 0.001). Exercise performance improved after SIT from 2 min of exercise at 90% of the peak work rate (0.86, p < 0.001).

**PURPOSE:** To determine the effect of 6 sessions of SIT over 2 wk on VO₂max, Qmax, and time trial performance was 5.8, 4.7, and 4.2%, respectively. Pre- and post-training measurements were compared using a paired t-test. RESULTS: VO₂max increased after SIT from 29.7 ± 6.9 yr, 68.8 ± 17.3 kg, and 46.2 ± 8.10 mL/kg/min, respectively) to 31.2 ± 6.9 yr, 71.5 ± 17.3 kg, and 47.0 ± 8.10 mL/kg/min, respectively. VO₂max was significantly greater (p < 0.001). EE (286.8 ± 69.2 kcal vs. 302.0 ± 67.3 kcal, p = 0.048) was significantly greater after SIT from 29.7 ± 6.9 yr, 68.8 ± 17.3 kg, and 46.2 ± 8.10 mL/kg/min, respectively) to 31.2 ± 6.9 yr, 71.5 ± 17.3 kg, and 47.0 ± 8.10 mL/kg/min, respectively. VO₂max was significantly greater (p < 0.001) after SIT from 29.7 ± 6.9 yr, 68.8 ± 17.3 kg, and 46.2 ± 8.10 mL/kg/min, respectively) to 31.2 ± 6.9 yr, 71.5 ± 17.3 kg, and 47.0 ± 8.10 mL/kg/min, respectively.

**CONCLUSIONS:** A SS during HIIE elicits greater EE and Tc versus not wearing a SS. Therefore, a SS may aid in weight loss by increasing the total amount of calories expended during HIIE.

**Keywords:** High-Intensity Interval Training, maximal oxygen consumption, lactate

**Board #55**

**May 30 8:00 AM - 9:30 AM**

**Short-Term Sprint Interval Training Increases Maximal Oxygen Uptake Without Changing Maximal Cardiac Output**

William Bostad, Devin McCarthy, Martin Gibala. McMaster University, Hamilton, ON, Canada. (Sponsor: Dr. Stuart Phillips, FACSM)

Email: bostadw@mcmaster.ca

**NO relevant relationships reported**

**Purpose:** The use of sauna suits (SS) has increased and claims to enhance weight loss and body temperature during exercise. Whether high-intensity interval exercise (HIIE) with a SS enhances energy expenditure (EE) and excess post-exercise oxygen consumption (EPOC) is unknown. The purpose of this study was to examine changes in EE and EPOC in response to HIIE while wearing a SS.

**Methods:** Seven recreationally active men and women (mean age, mass, and VO₂max = 29.7 ± 6.9 yr, 68.8 ± 17.3 kg, and 46.2 ± 8.10 mL/kg/min, respectively) completed 4 training sessions of HIIE with a SS. Participants completed 3 training sessions of HIIE without a SS. Prior to the first training session, subjects were randomized to either training condition. All training sessions were identical in duration and intensity. Exercise performance improved after SIT from 2 min of exercise at 90% of the peak work rate (0.86, p < 0.001). EE (286.8 ± 69.2 kcal vs. 302.0 ± 67.3 kcal, p = 0.048) was significantly greater after SIT from 29.7 ± 6.9 yr, 68.8 ± 17.3 kg, and 46.2 ± 8.10 mL/kg/min, respectively) to 31.2 ± 6.9 yr, 71.5 ± 17.3 kg, and 47.0 ± 8.10 mL/kg/min, respectively. VO₂max was significantly greater (p < 0.001) after SIT from 29.7 ± 6.9 yr, 68.8 ± 17.3 kg, and 46.2 ± 8.10 mL/kg/min, respectively) to 31.2 ± 6.9 yr, 71.5 ± 17.3 kg, and 47.0 ± 8.10 mL/kg/min, respectively.

**Conclusion:** HIIE with a SS elicits greater EE and Tc versus not wearing a SS. Therefore, a SS may aid in weight loss by increasing the total amount of calories expended during HIIE.

**Keywords:** High-Intensity Interval Training, maximal oxygen consumption, lactate

**Board #56**

**May 30 8:00 AM - 9:30 AM**

**High-Intensity Interval Exercise While Wearing A Sauna Suit Increases Energy Expenditure**

Aaron R.D. Matthews1, Todd A. Astorino, FACSM2, Ailish C. Sheard3. California State University, Los Angeles, Los Angeles, CA. 1California State University, San Marcos, San Marcos, CA. Email: amathai10@calstate.edu

**NO relevant relationships reported**

**Purpose:** To determine the effect of 6 sessions of SIT over 2 wk on VO₂max, Qmax, and time trial performance was 5.8, 4.7, and 4.2%, respectively. Pre- and post-training measurements were compared using a paired t-test. RESULTS: VO₂max increased after SIT from 29.7 ± 6.9 yr, 68.8 ± 17.3 kg, and 46.2 ± 8.10 mL/kg/min, respectively) to 31.2 ± 6.9 yr, 71.5 ± 17.3 kg, and 47.0 ± 8.10 mL/kg/min, respectively. VO₂max was significantly greater (p < 0.001). EE (286.8 ± 69.2 kcal vs. 302.0 ± 67.3 kcal, p = 0.048) was significantly greater after SIT from 29.7 ± 6.9 yr, 68.8 ± 17.3 kg, and 46.2 ± 8.10 mL/kg/min, respectively) to 31.2 ± 6.9 yr, 71.5 ± 17.3 kg, and 47.0 ± 8.10 mL/kg/min, respectively. VO₂max was significantly greater (p < 0.001) after SIT from 29.7 ± 6.9 yr, 68.8 ± 17.3 kg, and 46.2 ± 8.10 mL/kg/min, respectively) to 31.2 ± 6.9 yr, 71.5 ± 17.3 kg, and 47.0 ± 8.10 mL/kg/min, respectively.

**Conclusion:** HIIE with a SS elicits greater EE and Tc versus not wearing a SS. Therefore, a SS may aid in weight loss by increasing the total amount of calories expended during HIIE.

**Keywords:** High-Intensity Interval Training, maximal oxygen consumption, lactate

**Board #57**

**May 30 8:00 AM - 9:30 AM**

**HIIT PROGRAM EFFECTS IN CAPILLARY BLOOD LACTATE LEVELS**

Julio Alejandro GOMEZ FIGUEROA1, SANTIAGO CASTINEYRA MENDOZA2, LUIS QUINTANA RIVERA3, JOSE EDUARDO MOLINA ARRIOLA4, VICTOR OSIRIS RODRIGUEZ CERVANTES4, ANDREAS STAMATIS4. 1UNIVERSIDAD VERACRUZANA, BOCA DEL RIO, Mexico. 4STATE UNIVERSITY OF NEW YORK, PLATTSBURGH, NY. Email: julgomezuv@uv.mx

**NO relevant relationships reported**

**Purpose:** To investigate changes in La levels after 4 weeks of HIIT program. Methods: Blood samples were collected from five female and five male student-athletes (n=10) (M = 21 SD = 0.95). A short-term (4 weeks) HIIT protocol used and VO₂max calculated through Course-Navette Test. The instruments used for this research were an Accutrend Plus-Roche lactometer and BM-Lactate test strips (Risch-Rotkreuz, Switzerland). The analysis consisted of t student tests for paired samples in IBM SPSS v.25 (p <0.001). Results: VO₂max and blood La changed significantly in six participants (Pre-La M=11.65mmol/L; Post-La M=9.41mmol/L). The participants that achieved to increase their VO₂max, produced lower amounts of capillary blood La. Conclusion: Using HIIT, our study results confirm the positive relationship of VO₂max and La. The inferences of these preliminary results could be used in future, larger-scale interventions concerning ways to affect La production through the increase of VO₂max using a HIIT program. Future studies should further investigate anaerobic threshold modification processes through different training programs, such as Repeated Sprint Training (RST), Sprint Interval Training (SIT) and Moderate Intensity Continuous Training (MICT). Limitations of this study include small sample size and indirect VO₂max estimation.

**Keywords:** High-Intensity Interval Training, maximal oxygen consumption, lactate

Studies have determined that physical training provides benefits in people’s physical health. Physical exercise is one of the most powerful lifestyle to positively affect the adult brain and emerging evidence points to high intensity interval training (HIIT) as an effective way to improve various aspects of brain function among them the improvement of cognition and short-term memory. Purpose: To analyze the effects of HIIT in university students. Methods: 22 university athletes (Mage=21.6, SD= 1.5), (n=11 experimental group), (n=11 control group). A HIIT program of 12 sessions of short-term (3 weeks) and 5 sessions of short-term memory was evaluated. Maximum oxygen consumption (VO₂max) was estimated through the Course Navette Test and memory evaluation through a Rey Auditory Verbal Learning Test (AVLT). The instruments used for the investigation was a Polar H10® band. A student test for paired samples was applied by IBM SPSS v.22 (p <0.001). Results: The maximum heart rate (HRmax) of the control group obtained a value of M = 199.9, SD = 15pm and the experimental group M = 195, SD = 6.7pm. In the third week of intervention results were found statistically significant. Conclusion: After twelve training sessions of high intensity physical exercise (HIIT), statistically significant results were obtained, in relation to high intensity physical effort with short-term memory. For future research it is recommended to implement a greater number of training and memory sessions. Limitations of this study include indirect VO₂max estimation and a small sample size.

**Keywords:** short-term memory, university students, high intensity interval training.
Although high-intensity functional training (HIFT) is an increasingly popular exercise strategy, research describing the acute physiological responses are few and predominantly limited to novice or untrained. PURPOSE: To compare the cardiorespiratory responses of a bout of HIFT among individuals with varying degrees of skill. METHODS: Twenty-two participants (31.0 ± 7.4 years; 172.6 ± 9.6 cm; 77.9 ± 13.8 kg) with at least six-months of HIFT experience and varying skill levels were tested. Skill level was categorized by self-reported times of the benchmark workout “Fran” [Novice (NOV), n = 32; Intermediate (INT), n = 24; Advance (ADV), n = 26; (times reported = 5.3 ± 2.7 mins)]. All participants performed aerobic capacity testing to examine peak levels of oxygen consumption (VO2max), heart rate (HR), respiratory exchange ratio (RER), and lactate (La) levels. A week later, similar variables were measured with averages obtained for VO2, HR, RER, and LT during a 15-minute HIFT based workout. Univariate analysis of variance (ANOVA) with Bonferroni adjustments were used to examine differences between skill category and outcome variables. RESULTS: During the Treadmill test, significant differences were only observed for VO2max (ADV = 49.53 ± 5.12 ml/kg/min; NOV = 43.83 ± 6.90 ml/kg/min; p = 0.001; η2 = 0.924) and LT (ADV = 12.81 ± 2.48 mmol/dL; NOV = 9.93 ± 3.33 mmol/dL; p = 0.004; η2 = 0.874), with ADV athletes having greater values than NOV (p < 0.05). No significant differences were observed between ADV & INT (p > 0.05). Similarly, during the HIFT workout, differences were also observed between ADV and NOV categories, but only for VO2 (ADV = 38.71 ± 3.47 ml/kg/min; NOV = 34.42 ± 5.20 ml/kg/min; p < 0.001; η2 = 0.946). CONCLUSION: These findings provide evidence regarding the impact skill level has on physiological outcomes. During a maximal effort bout of HIFT, the more advanced athletes tend to exhibit more efficient cardiorespiratory markers. Further research is necessary to elucidate how these differences impact overall performance of HIFT exercise.

Only ~20% of adults adhere to physical activity guidelines. Thus, exercise programs that require less time, such as high intensity interval training (HIIT), need to be investigated. Recent studies suggest HIIT incorporating body weight exercises result in increased exercise capacity (VO2peak) and leg muscle endurance in healthy adults. PURPOSE: It is unclear if HIIT incorporating body weight exercises influences body composition and exercise capacity in overweight/obese, sedentary adults. We hypothesized that HIIT will increase lean mass and decrease body fat and 2) increase VO2peak to a greater extent than moderate intensity continuous training (MICT) in sedentary, overweight/obese adults.

METHODS: Eleven participants (10 women) were randomized and have completed all study components (6 HIIT vs. 5 MICT; Age: HIIT 39±7 vs. MCT 42±12 yrs; BMI: HIIT: 30.1 vs. 32.3 kg/m2 [both, p<0.05]; Exercise capacity (VO2peak-cardio pulmonary exercise testing) and body composition (via dual energy X-ray absorptiometry) were measured at baseline and after 12 weeks of training. The HIIT group performed 5 body weight exercises (squats, pushups, lunges, mountain climbers, and plank) 3 days/week for 12 weeks at an intensity equal to a rating of perceive exertion (RPE) >17. The MICT group performed 150 min of MICT/week for 12 weeks at a RPE between 12-14.

RESULTS: Percent (%) lean mass increased from baseline following HIIT (p<0.05), but not MICT (HIIT: 45.9±4.1 vs. MICT: 44.0±4.0 %). Body fat % significantly decreased from baseline following HIIT (p<0.05), but not MICT (HIIT: 43.9±3.5 vs. 42.7±4.1 %; MICT: 45.9±4.1 vs. 46.7±4.7 %). BMI was not different from baseline following HIIT or MICT (HIIT: 32.3± 3.3 vs. 31.3±1.9 kg/m2; MICT: 30.1± 3.0 vs. 38.0±3.7 kg/m2). VO2peak significantly increased from baseline following HIIT (p<0.05), but not MICT (HIIT: 23.7±0.9 vs. 25.0±0.9 ml/kg/min; MICT: 22.2±1.6 vs. 23.1±1.6 ml/kg/min). CONCLUSIONS: These preliminary data support the hypotheses that non-traditional aerobic HIIT (e.g., HIIT incorporating body weight exercises) leads to more advantageous changes in body composition and exercise capacity compared to MICT alone.

Steady states are known as effective tools to improve physical fitness. Unlike most types of exercise bikes, a stationary air bike has handles that move synchronously with the pedaling action, creating wind resistance via a large fan. Although several studies have been conducted on exercise bikes, there has been a relative absence of studies using stationary air bikes in order to compare the effects of high intensity interval training (HIIT) and moderate intensity continuous training (MICT) protocols.

PURPOSE: The purpose of this study was to compare the effects of stationary air biking, utilizing MICT, ultrashort-HIT (UH), and short-HIT (SH) protocols on aerobic performance. METHODS: Thirty-two recreationally active participants were randomly assigned to MICT (n = 11), UH (n = 11), and SH (n = 10) groups. The intervention consisted of 3 sets of 8 intervals at all-out intensity (HIIT) and a RPE >17. The MICT group comprised 30 min of cycling at 75% of maximal heart rate reserve, while the HIIT protocols (i.e., UH, SH) consisted of 3 sets of 8 intervals at all-out intensity, SH and US protocols were performed with 2:10s and 10s:5s work-to-rest ratios, and provided with 5- and 2.5-min recovery periods between sets, respectively. Maximal oxygen uptake was assessed via a cycle ergometer using a ramp protocol before and after the intervention. Absolute VO2max increased from baseline following HIIT or MICT (HIIT: 32 ±3 vs. 31±3 kg/m2; MICT: 43.9±3.5 vs. 42.7±4.1 %; P < 0.05). No significant differences were observed between MICT and UH (p > 0.05). CONCLUSION: Despite the significant group differences in VO2peak, all groups similarly improved aerobic performance.
High-intensity interval training (HIIT) is an effective and time-efficient method of aerobic training. Most HIIT programming relies on objectively determined work rate, velocity, or heart rate targets. There is very little evidence comparing HIIT that is objectively determined HIIT may have more real-world applicability.

**METHODS:**

To evaluate the oxidative cost of both the work (W) interval and recovery (R) interval during HIIT (at a workload equivalent to 100% Max VO₂), Methods: All 20 second work periods were followed by recovery intervals of 10, 20, 30 and 40% at 20% of Max VO₂. Methods: 12 recreationally active college-age students (age: 21.6 ± 1.1 yrs., height: 171.41 ± 0.5 cm, body mass: 75.0 ± 10.6 kg, max VO₂: 2.89 ± 0.67 L/min) volunteered to participate in HIIT trials established the max workload. VO₂ was obtained by continuous open circuit spirometry and blood lactate by finger puncture. Excess Post Exercise Oxidation (EPOC) was obtained for 20 min. Results: Statistical analysis by ANOVA with repeated measures (P<0.05) was applied to these data.

**Conclusion:** The prescribed HIIT workloads provide ample metabolic stimulus, however recovery intervals in excess of 30 seconds substantially attenuate the oxygen uptake, while still requiring a strong anaerobic contribution. The use of eight repeat bouts of HIIT at a workload equivalent to 100% of max VO₂ may be a viable alternative to the traditional Tabata protocol.

**High-intensity interval training (HIIT) is an effective and time-efficient method of aerobic training. Most HIIT programming relies on objectively determined work rate, velocity, or heart rate targets.**

**Results:**

- VO₂ max: L/min
  - HIIT Trial 1: 2.59 ± 0.22
  - HIIT Trial 2: 2.52 ± 0.55
- HR (b/min):
  - HIIT Trial 1: 181 ± 17.0
  - HIIT Trial 2: 179 ± 8.8
- LA (mmol/L):
  - HIIT Trial 1: 15.0 ± 2.9
  - HIIT Trial 2: 14.7 ± 3.3

**With the exception of interval one, recovery protocols of 10, 20 and 30 sec sustained significantly greater oxygen requirements during W & R vs the 40 sec trial. W was in excess of 90% of max VO₂ for 10, 20 & 30 trials, while the 40 sec recovery bout HIIT protocol provided significantly less oxidative requirements and never achieved 90% Oxidative requirement during interval training, which may be attributed to insufficient phosphagen resynthesis during recovery.**

**MEDICINE & SCIENCE IN SPORTS & EXERCISE®**

**S802 Vol. 52 No. 5 Supplement**

(i.e., A-VO2max, TTE) following training. These findings suggest that performing HIIT on a stationary air bike at a 10x5s work-to-rest ratio can improve aerobic fitness with a shorter time commitment compared to SH and MCT groups.

**Board #63**

**Metabolic And Hemodynamic Responses To High Intensity Interval Training With Various Recovery Intervals**

Robert Otto, FACSM, Justin St Peter, Erica Koutch, Kerrianne Nordland, Colin Shaw, Rebecca Flax, Michele Aquino, John Petrizzo, John Wygand, FACSM. Adelphi University, Garden City, NY.

Email: otto@adelphi.edu

(No relevant relationships reported)

For more than twenty years, the Tabata protocol has provided the basis for high intensity interval training (HIIT). Although the improvements associated with the protocol are laudable, an intensity of 170% of Max VO₂ is difficult for even highly motivated athletes to achieve. A repeated bout HIIT protocol at 100% of Max VO₂ may be a more tolerable option, if it achieves a similar metabolic stress. Purpose: The purpose was to determine the metabolic cost of 8 repetitions of HIIT at a workload equivalent to 100% Max VO₂ (HIIT) for 20 sec with recovery intervals of 10, 20, 30 and 40 sec at 20% of Max VO₂. Methods: 14 recreationally active college-age students (age: 21 ± 1.1 yrs., height: 171.410 ± 0.5 cm, body mass: 75.0 ± 10.6 kg, max VO₂: 2.89 ± 0.67, L/min) volunteered to participate in a randomized, single-blind crossover design study with a minimum of 4 days between trials. A max VO₂ ramp protocol preceded the HIIT trials and established the max workload. VO₂ was obtained by continuous open circuit spirometry and blood lactate by finger puncture. Excess Post Exercise Oxidation (EPOC) was obtained for 20 min. Results: Statistical analysis by ANOVA with repeated measures (P<0.05) was applied to the following data.

**HIIT Trial**

<table>
<thead>
<tr>
<th>Interval</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>VO₂, % max</td>
<td>90.2 ± 4.5</td>
<td>87.9 ± 6.4</td>
<td>86.9 ± 6.8</td>
<td>81.6 ± 7.2*</td>
</tr>
<tr>
<td>VO₂, max L/min</td>
<td>2.59 ± 0.22</td>
<td>2.52 ± 0.55</td>
<td>2.49 ± 0.6</td>
<td>2.33 ± 0.5</td>
</tr>
<tr>
<td>HR (b/min)</td>
<td>181 ± 17.0</td>
<td>179 ± 8.8</td>
<td>176 ± 7.8</td>
<td>173 ± 6.5</td>
</tr>
<tr>
<td>LA (mmol/L)</td>
<td>15.0 ± 2.9</td>
<td>14.7 ± 3.3</td>
<td>15.2 ± 3.6</td>
<td>14.2 ± 2.6</td>
</tr>
<tr>
<td>20 min EPOC (L)</td>
<td>2.66 ± 1.0</td>
<td>2.52 ± 0.7</td>
<td>2.82 ± 0.7</td>
<td>2.47 ± 0.9</td>
</tr>
</tbody>
</table>

**Conclusion:** The prescribed HIIT workloads provide ample metabolic stimulus, however recovery intervals in excess of 30 seconds substantially attenuate the oxygen uptake, while still requiring a strong anaerobic contribution. The use of eight repeat bouts of HIIT at a workload equivalent to 100% of max VO₂ may be a viable alternative to the traditional Tabata protocol.

**Board #65**

**The Oxidative Contribution Of Eight Repeat Bouts Of High Intensity Interval Training**

John Petrizzo, Michele Aquino, Colin Shaw, Justin St Peter, Erica Koutch, Rebecca Flax, Kerrianne Nordland, John Wygand, FACSM, Robert M. Otto, FACSM. Adelphi University, Garden City, NY. (Sponsor: Robert Otto, FACSM)

Email: JPettrizzo@adelphi.edu

(No relevant relationships reported)

**PURPOSE:** To compare the effects of the ETM in conjunction with high intensity interval training (HIIT) and ETM alone (i.e., using mask with no resistance) on lung function. METHODS: Sixteen healthy adults (control group, n=8 & experimental group, n=8) participated in this study. Pre- and post-test consisted of lung function (FEV1, FVC) using spirometer, time to exhaustion (TTE) using the
Bruce protocol on treadmill, and body mass index (BMI). Training was completed on a cycle ergometer on 3 consecutive days per week (MWF), for 4 wks. Participants exercised at 85% of HRmax, using heart rate monitor, with a pedal rate of 100-120 rpm at individually set resistance levels. Each training session consisted of 10 bouts of 30s exercise followed by 30s of active recovery for a total time of 10 min. The respiratory resistance on the ETM for the experimental group was progressively increased from 915.4 m2·1·s−1·atm−1 (3,000 ft) during wks of training, while the control group used ETM with no resistance. RESULTS: Following training, a significant difference in FVC between the groups was found (F (1, 4) = 7.486, p = 0.016). In addition, no significant (p > 0.05) differences between the groups in FEV1 (experimental: 3.78 ± 0.94l.; control: 3.83 ± 0.59l.), TTE (experimental: 11:30 ± 1.92min; control: 12:23 ± 1.60min) and BMI (experimental: 23.01 ± 3.24kg/m2; control: 24.25 ± 2.97kg/m2) was noted. However, the experimental group yielded a greater increase in FEV1 compared to the control group (experimental: 3.49%; control: 2.42%). CONCLUSION: In the present study, the ETM resulted in a small increase in FEV1, and significantly improved FVC more than HIIT alone. Using the ETM in conjunction with HIIT might significantly improve lung function compared to HIIT only. When used in conjunction with HIIT, the ETM appears to create sufficient resistance to strengthen the muscles in respiratory ventilation and improve respiratory efficiency.

3750 Board #67 May 30 8:00 AM - 9:30 AM Effects Of Deep Slow Breath Training On Performance And Recovery During High Intensity Interval Cycling Andrew Brown. Western Washington University, Bellingham, WA. (Sponsor: Dr. Lorrie Brilla, FACSM) (No relevant relationships reported)

Andrew Brown, Lorrie R. Brilla FACSM, Harsh H. Buddhadev, David N. SupraHealth and Human Development Department, Western Washington University, Bellingham WA 98225.

Voluntary alterations in components of the respiratory cycle have been utilized for centuries in yoga, qigong, and other meditative practices, and represent a fertile area of research within the context of sport performance. Changes to acid-base balance, volitional tone, and subsequent exercise performance following breath training have been demonstrated acutely and chronically. The efficacy of breath training in improving repeated glycolytic sprints has yet to be fully elucidated. PURPOSE: To delineate the effects of a six-week deep slow breathing (DSB) program on measures of cycling performance (mean power), recovery (heart rate recovery: HRR), and expired carbon dioxide: VCO2), and pulmonary capacities (maximum voluntary ventilation and forced expiratory volume in 1 sec: FEV1) compared to control (BELL). METHOD: Twenty male cyclists were divided into training (n=10) and control (n=10) groups, where the training group completed a six-week DSB program. Inclusion criteria included a minimum of 180-minutes of cycling volume per week for the previous 6 months. DSB was an app-programmed to extend extensions and post-expiratory breath holds to enhance vagal tone and endogenous buffering capacity. Participants completed two testing sessions, one before and one after the six-week period. Testing sessions involved three repeated 30-second Wingate Anaerobic Tests (WAnT) with three minutes of passive recovery between each interval. MP was recorded for each WAnT while measures of VCO2 and HR were taken immediately following each WAnT. RESULTS: No significant differences (p > 0.05) were found between groups for any of the variables measured, while both groups exhibited increased MP in the second WAnT following the six-week training period (Treatment: pre: 516.30 ± 20.82 W versus post: 536.38 ± 20.62 W; p = 0.010; ηp² = 0.382; Control: pre: 549.93 ± 18.66 W versus post: 567.83 ± 18.44 W; p = 0.010; ηp² = 0.382). CONCLUSIONS: The results presented here suggest DSB provides no performance relevant to recovery or pulmonary capacities during high intensity interval cycling, beyond those which are incurred via endurance training.

3751 Board #68 May 30 8:00 AM - 9:30 AM The Effects Of Rich Hydrogen And Oxygen Mixed Gas Inhalation After High Intensity Exercise Influence On Exercise Performance Yudai Shiibayama1, Shohei Dobashi1, Tamotsu Fukuda2, Takaaki Arisawa1, Katsuhiko Koyama1. 1University of Yamanashi, Kofu, Japan. 2HeliX Japan Co. Ltd., Tokyo, Japan. (No relevant relationships reported)

PURPOSE: Both hydrogen-rich and normobaric hypoxic gas exposure during exercise recovery exercise is to promote ergogenic and therapeutic effects on the whole body physiological function and exercise performances. However, the synergistic intervention of high concentrations of hydrogen and oxygen mixture gas (HO gas) inhalation on these indexes have been poorly investigated. Therefore, we examined acute HO gas inhalation during exercise recovery on subsequent oxidative stress, inflammation, and exercise performance.

METHOD: According to a two-trial, double-blind, crossover, repeated measures design, eight physically males inhaled HO gas (67 % of hydrogen and 32 % of oxygen) or Placebo gas (ambient air) during 60-min recovery after completion of oxidative stress-inducing exercise protocol consisting of 30-min treadmill running at 75 % of participant’s maximal oxygen uptake (VO2 max) and 5 × 10 repetitions of squat jump exercise. Before oxidative stress-inducing exercise and 10-min after post exercise gas inhalation, blood and expired samples were obtained and exercise performance (jumping ability, pedaling power output, muscle strength) were evaluated.

RESULTS: A post-exercise HO gas inhalation attenuated the increase 8-OHdG excretion rate (p < 0.05), known as one of DNA oxidation markers, and the reduction in the jumping ability evaluated by the height of countermovement jump (p < 0.05) compared with Placebo gas inhalation. Moreover, the increase in urinary 8-OHdG excretion rate was significantly associated with the reduction in countermovement jump performance (r = -0.78, p < 0.01).

Discussion: These suggested that HO gas inhalation during post exercise recovery might, at least in part, improve exercise performance via reducing systemic oxidative damage.

G-33 Free Communication/Poster - Monitoring Saturday, May 30, 2020, 8:00 AM - 10:30 AM Room: CC-Exhibit Hall

3753 Board #70 May 30 8:00 AM - 9:30 AM Global Positioning System Analysis Of Positional Locomotive Training Demands In Women's Varsity Rugby Union Danielle L. E. Nyman, Lawrence L. Spriet, FACSM. University of Guelph, Guelph, ON, Canada. (No relevant relationships reported)

Rugby union is a full contact, intermittent-intensity sport that requires a combination of power, agility, speed and endurance. In positional gameplay, forwards compete in high-intensity play (sprints, rucks, mauls), while backs typically execute sprint and agility focused activities. PURPOSE: To determine the locomotive demands of female varsity rugby union athletes through regular season training, and to assess positional dissimilarities in these demands, using global positioning system (GPS) technology. METHODS: Wearable GPS technology was used to collect spatial and temporal data of female varsity rugby athletes (20.2 ± 2.4 yr) during three regular season

Abstracts were prepared by the authors and printed as submitted.
training sessions, each ~2 hr in length. Sessions were categorized as endurance training (ET), skill training (ST) or game-based training (GBT). Movements were catalogued into 5 speed zones. Player positions were classified as forward (n=14) or back (n=15). RESULTS: Backs traveled greater total distances on all practice days than forwards, and in ET backs traveled greater distances per minute than forwards (50.07 ± 6.67 m; 47.95 ± 16.64 m, p < 0.01). Positional work-to-rest ratio was higher in forwards vs. backs in ET only (0.244 ± 0.158; 0.230 ± 0.051, p < 0.05). Backs traveled greater total distances in high-intensity zones than forwards (7.23 ± 4.34 %; 4.32 ± 5.0 %, p < 0.05) during GBT. In all practice sessions, significant differences between positions were observed in time spent and distance traveled within the 5 speed zones. CONCLUSION: Locomotive training demands for back positions are of higher intensity in GBT, and greater volume on all practice days, compared to forward positions. ET was the only session that exhibited a significantly higher work-to-rest ratio for forwards. Though GPS technology is effective for quantifying linear movements, it is not capable of quantifying athlete exertion in low-speed, high-power movements, performed by forwards in rugby union. Research funded by a grant from NSERC, Canada.

3754 Board #71 May 30 8:00 AM - 9:30 AM Associations Between Two Athlete Monitoring Systems Used To Quantify External Training Loads In Basketball Players
Keldon Peak, Aaron Heishman, Ryan Miller, Eduardo Freitas, Brady Brown, Michael Bemben, FACSM. University of Oklahoma, Norman, OK. (Sponsor: Michael G. Bemben, FACSM)
Email: keldon.peak@ou.edu

Quantifying external training load (eTL), referred to as the biomechanical load during training, is becoming increasingly popular for team sport in an effort to manage fatigue, optimize performance, and guide return-to-play protocols following injury. During indoor team sport play, eTL can be measured via Inertial Measurement Units (IMUs) which incorporate accelerometers, gyroscopes, and a magnetometer to characterize an athlete’s movement signature, while Indoor Positioning Systems (IPS) are also common, which use Ultra-wideband (UWB) to detect player positioning and their subsequent movements. PURPOSE: The purpose of this study was to assess the association between a commercially available IMU and IPS used to monitor eTL in team sport. METHODS: A retrospective analysis was performed on 13 elite male NCAA Division 1 basketball players from three practices during the off-season training phase. A Pearson’s correlation was used to examine the association between a commercially available IMU and IPS used to monitor eTL in team sport. RESULTS: There were significant (p ≤ 0.001) positive correlations between Distance and PL (r=0.858), PL/Min (r=0.891), PL2D (r=0.809), PL1D-FWD, PL1D-SIDE, and PL1D-UP captured from the Catapult Sport IMU. Tukey: There were significant (p ≤ 0.001) positive correlations between Distance and PL (r=0.974), PL-Min (r=0.981), PL2D (r=0.951), PL1D-FWD (r=0.972), PL1D-SIDE (r=0.944), and PL1D-UP (r=0.972), while Practice 3 also displayed significant (p ≤ 0.001) positive correlations between Distance and PL (r=0.958), PL-Min (r=0.972), PL2D (r=0.901), PL1D-FWD (r=0.819), PL1D-SIDE (r=0.944), and PL1D-UP (r=0.972), while Practice 3 also displayed significant (p ≤ 0.001) positive correlations between Distance and PL (r=0.958), PL-Min (r=0.972), PL2D (r=0.901), PL1D-FWD (r=0.819), PL1D-SIDE (r=0.944), and PL1D-UP (r=0.972). CONCLUSION: These data suggest a strong association between parameters captured by the two systems used to monitor eTL, however coaches and performance practitioners should be aware that each system may potentially provide unique information used to monitor and track eTL of athletes during basketball play.

3755 Board #72 May 30 8:00 AM - 9:30 AM Using A 3d-accelerometer To Enhance Task Assessment
Myles J. Polsgrove, Christopher Pomerleau, Deborah Jackson. Husson University, Bangor, ME.
Email: mjpol@yahoo.com

PURPOSE: Traditional fitness assessments use a standard test battery to gather outcome values that quantify movement capacity in terms of a generalized rating. While valuable, such assessments overlook the process-oriented aspects of a task performance. Triaxial accelerometers (TA) may help provide more process-oriented tracking of human movements by recording acceleration values. The purpose of this comparative analysis was to establish how TA’s may provide more robust measures of task performance. METHODS: Male subjects (N=10) wore TA’s while performing 2 tasks (squats (SQ) & pushup (PU)) at a moderate task workload. Using acceleration data variables of amplitude (AMP) and frequency (FQ) per repetition were determined for each task. For each, mean (m), STDV, ANOVA, and post hoc tests for significant differences were compiled.
RESULTS: AVG Subject Parameters: AGE: 41.7y.o., BW: 84kg, HT: 185.0cm. Means & STDV:

<table>
<thead>
<tr>
<th>SQ</th>
<th>AMP</th>
<th>STDV (+/-)</th>
<th>FQ</th>
<th>STDV (+/-)</th>
<th>PU</th>
<th>AMP</th>
<th>STDV (+/-)</th>
<th>FQ</th>
<th>STDV (+/-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>1.20</td>
<td>.05</td>
<td>1.946</td>
<td>.06</td>
<td>1.13</td>
<td>.06</td>
<td>1.14</td>
<td>.03</td>
<td></td>
</tr>
<tr>
<td>S2</td>
<td>1.04</td>
<td>.05</td>
<td>1.899</td>
<td>.12</td>
<td>1.18</td>
<td>.09</td>
<td>1.08</td>
<td>.04</td>
<td></td>
</tr>
<tr>
<td>S3</td>
<td>0.88</td>
<td>.08</td>
<td>2.69</td>
<td>1.2</td>
<td>0.84</td>
<td>.07</td>
<td>2.19</td>
<td>.12</td>
<td></td>
</tr>
<tr>
<td>S4</td>
<td>0.64</td>
<td>.07</td>
<td>3.03</td>
<td>.17</td>
<td>1.03</td>
<td>.11</td>
<td>1.90</td>
<td>.07</td>
<td></td>
</tr>
<tr>
<td>S5</td>
<td>0.32</td>
<td>.70</td>
<td>2.89</td>
<td>3.3</td>
<td>0.97</td>
<td>.05</td>
<td>2.04</td>
<td>.08</td>
<td></td>
</tr>
<tr>
<td>S6</td>
<td>0.60</td>
<td>.08</td>
<td>2.21</td>
<td>.09</td>
<td>0.74</td>
<td>.07</td>
<td>1.63</td>
<td>.28</td>
<td></td>
</tr>
<tr>
<td>S7</td>
<td>0.59</td>
<td>.04</td>
<td>3.10</td>
<td>.34</td>
<td>0.81</td>
<td>.09</td>
<td>2.02</td>
<td>.18</td>
<td></td>
</tr>
<tr>
<td>S8</td>
<td>0.49</td>
<td>.04</td>
<td>2.30</td>
<td>.16</td>
<td>1.32</td>
<td>.99</td>
<td>0.81</td>
<td>.03</td>
<td></td>
</tr>
<tr>
<td>S9</td>
<td>0.56</td>
<td>.05</td>
<td>3.39</td>
<td>.36</td>
<td>0.99</td>
<td>.07</td>
<td>2.10</td>
<td>.10</td>
<td></td>
</tr>
<tr>
<td>S10</td>
<td>1.40</td>
<td>.09</td>
<td>1.59</td>
<td>.05</td>
<td>0.99</td>
<td>.07</td>
<td>1.11</td>
<td>.04</td>
<td></td>
</tr>
</tbody>
</table>

ANOVA: SQ: AMP (F-critical 2.0): F-value 251.4 Tukey (7 out of 46 mean differences), FQ-value 79.8, Tukey (12 out of 46 mean differences), PU: AMP (F-critical 1.98): F-value 36.1 Tukey (23 out of 46 mean differences) FQ: F-value 50.3, Tukey (18 out of 46 mean differences). CONCLUSION: Task measures of acceleration (AMP and FQ) revealed that subject results varied significantly. These findings suggest individuals rely on varying solutions to movement, and performance outcomes may be partially attributable to these differences. Assessments relying on both measurement types may provide more robust performance information.

3756 Board #73 May 30 8:00 AM - 9:30 AM The Effects Of Home Versus Away Travel On Urine Specific Gravity In NCAA DII Volleyball Athletes
Olivia M. Dean1, Alyssa M. Pollard-McGrandy2, Brian C. Rider1, Adam M. Coughlin1, Saginaw Valley State University, University Center, MI. Wayne State University, Detroit, MI. Hope College, Holland, MI. (Sponsor: Rebecca Schlaff, FACSM)
Email: keldon.peak@ou.edu

Specific gravity (USG) has historically been utilized to classify an individual’s hydration status. Road trips, with decreased willingness to drink and increased “road food” selection, may affect athletes’ hydration status. Athletic performance has been shown to be affected by hydration status. PURPOSE: To compare urine specific gravity of home versus away weekends for DII volleyball athletes. METHODS: Fourteen NCAA Division II female collegiate volleyball athletes (Redshirt = 2, Freshmen = 1, Sophomore = 7, Junior = 1, Senior = 1) participated in this study. Urine was collected in sterile cups in the hours preceding games. Collections for away competitions (AW) were pre-trip Friday, post-trip/pre-game Friday, and post-trip/pre-game Saturday. Participants competed against the same two teams for home and away weekends. Urinalysis was conducted via reagent strips, according to manufacturer’s instructions. Data were analyzed via repeated measures ANOVA with an a priori level of 0.05.
RESULTS: USG during HM Friday and HM Saturday were 1.015±0.008 and 1.013±0.006, respectively. USG from AW pre-trip Friday, AW post-trip Friday, and AW post-trip Saturday were 1.011±0.007, 1.012±0.005, and 1.014±0.003, respectively. Post hoc analysis revealed no significant findings (range in n-values were 0.144–0.845). While no statistical significance was shown from the data analysis, there were some interesting trends. Overall, USG decreased during the HM weekend and gradually increased over the AW weekend. Only 17% of the athletes increased USG during HM weekends. Though GPS technology is effective for quantifying linear movements, it is not capable of quantifying athlete exertion in low-speed, high-power movements, performed by forwards in rugby union. Research funded by a grant from NSERC, Canada.
GPS sports watches are a convenient tool used to monitor improvement and predict race performance. Ensuring these watches are accurate allows runners to specifically plan out training to reach a desired race time. However, if predicted race time is inaccurate, an athlete may become frustrated during training or not reach their goals.

**PURPOSE:** The purpose of this study was to determine if a GPS sports watch accurately predicts 5k race time. **METHODS:** Nineteen participants (26.8 ± 7.9 years) were recruited for this study. Eligibility included participants running at least 30 minutes a day, three times a week. Participants were required to visit the EMU Running Science Laboratory on two separate occasions. During the initial visit, participants completed a VO2max test on a treadmill. Participants then completed a 5k race time trial on a 26.7m indoor track (measured 5k). A paired-samples t-tests was used to compare predicted 5k to measured 5k (p < 0.05). **RESULTS:** Three participants were excluded due to failure to return for the second visit. The remaining 16 participants (5 female, 11 male) had an average VO2max of 45.0 ± 9.1 ml/kg/min, height of 172.9 ± 7.0cm, and weight of 69.5 ± 9.0 kg. There was a significant difference between measured 5k race time (25.3 ± 4.7min) and predicted 5k race time (21.1 ± 2.5min) indicating that the GPS watch underpredicted 5k race time. **CONCLUSION:** The GPS sports watch underpredicted 5k time by approximately four minutes. The prediction from the GPS sports watch was based on factors such as speed, heart rate, and distance measured while participants wore the watch for two weeks. Failure to accurately measure heart rate at the radial pulse, inaccuracy associated with GPS, and varied training intensity while wearing the watch could explain some of the error.

**Accuracy Of 5K Race Time Using A Gps Sports Watch**

Andrew James Brink, Andrea D. Workman, Rebecca W. Moore. Eastern Michigan University, Ypsilanti, MI. (Sponsor: Michael J Saunders, FACSM)
(No relevant relationships reported)

**PURPOSE:** The purpose of this study was to determine if a GPS sports watch accurately predicts 5k race time. **METHODS:** Nineteen participants (26.8 ± 7.9 years) were recruited for this study. Eligibility included participants running at least 30 minutes a day, three times a week. Participants were required to visit the EMU Running Science Laboratory on two separate occasions. During the initial visit, participants completed a VO2max test on a treadmill. Participants then ran at a self-selected speed while grade increased 2% every two minutes until voluntary exhaustion.

Following the VO2max test, participants were shown how to use a GPS sports watch and instructed to run three days a week for at least 30 minutes for two weeks. After two weeks, participants returned for their second visit and predicted 5k time was recorded from the GPS sports watch. Participants then completed a 5k race time trial on a 26.7m indoor track (measured 5k). A paired-samples t-tests was used to compare predicted 5k to measured 5k (p < 0.05). **RESULTS:** Three participants were excluded due to failure to return for the second visit. The remaining 16 participants (5 female, 11 male) had an average VO2max of 45.0 ± 9.1 ml/kg/min, height of 172.9 ± 7.0cm, and weight of 69.5 ± 9.0 kg. There was a significant difference between measured 5k race time (25.3 ± 4.7min) and predicted 5k race time (21.1 ± 2.5min) indicating that the GPS watch underpredicted 5k race time. **CONCLUSION:** The GPS sports watch underpredicted 5k time by approximately four minutes. The prediction from the GPS sports watch was based on factors such as speed, heart rate, and distance measured while participants wore the watch for two weeks. Failure to accurately measure heart rate at the radial pulse, inaccuracy associated with GPS, and varied training intensity while wearing the watch could explain some of the error.

**The Application Of Statistical Process Control In Athlete Monitoring: Case Study Series**

Ai Ishida, S. Kyle Travis, Jeremy A. Gentles. East Tennessee State University, Johnson City, TN. Email: aia041816@gmail.com
(No relevant relationships reported)

To optimize sport performance, it is important for practitioners to assess training loads (TLs) and subsequent responses within individual athletes. Published research pertaining to athletes often report group or aggregate data. Investigations that present data from individual athletes are rare, particularly in a team setting. However, statistical process control (SPC) is often used in case studies of individual athletes where SPC is used to identify variances outside of normal ranges. **PURPOSE:** To determine the efficacy of using SPC to assess subjective measures of perceived wellness (PW) scores coupled with session rating of perceived exertion (sRPE) and global positioning system (GPS) derived TLs among soccer players. **METHODS:** Five NCAA Division I female soccer players (21.0 ± 1.3yr, 165.7 ± 4.3cm, 60.4 ± 5.2kg) from five sports (tennis, soccer, lacrosse, basketball, and track & field) were selected for analysis. The athletes completed the questionnaire by noon seven days per week. The athletes completed the questionnaire by noon seven days per week. Three participants were excluded: two due to injury and one due to an upcoming professional commitment. A customized questionnaire was used for players to report PW consisting of six subscales ranging from 1 (poor) to 5 (excellent). The athletes completed the questionnaire by noon seven days per week. PW subscales were summed and used for assessment. TLs including sRPE and total TLs were calculated for each visit. The goal of this study was to analyze the post-exercise on temporal robustness of sRPE as well as the difference between coach-intended RPE and athlete-reported sRPE.

**PURPOSE:** To determine the accuracy of an Epifluidic patch with subsequent responses within individual athletes. A customized questionnaire was used for players to report PW consisting of six subscales ranging from 1 (poor) to 5 (excellent). The athletes completed the questionnaire by noon seven days per week. PW subscales were summed and used for assessment. TLs including sRPE and total TLs were calculated for each visit. The goal of this study was to analyze the post-exercise on temporal robustness of sRPE as well as the difference between coach-intended RPE and athlete-reported sRPE.

**FIELD-BASED VALIDATION OF AN EPIFLUIDIC COLORIMETRIC PATCH FOR ON-SKIN ANALYSIS OF REGIONAL SWEAT CHLORIDE CONCENTRATION**


**Purpose**

To analyze the post-exercise on temporal robustness of sRPE as well as the difference between coach-intended RPE and athlete-reported sRPE.

**Methods**

Fourteen subjects (17 male, 29 female; 17.1 ± 0.8 y; 64.2 ± 10.2 kg) from five sports (tennis, soccer, lacrosse, basketball, and track & field) were selected for analysis. The athletes completed the questionnaire by noon seven days per week. Three participants were excluded: two due to injury and one due to an upcoming professional commitment. A customized questionnaire was used for players to report PW consisting of six subscales ranging from 1 (poor) to 5 (excellent). The athletes completed the questionnaire by noon seven days per week. PW subscales were summed and used for assessment. TLs including sRPE and total TLs were calculated for each visit. The goal of this study was to analyze the post-exercise on temporal robustness of sRPE as well as the difference between coach-intended RPE and athlete-reported sRPE.

**RESULTS:** The GPS sports watch underpredicted 5k race time (25.3 ± 4.7min) and predicted 5k race time (21.1 ± 2.5min) indicating that the GPS watch underpredicted 5k race time. **CONCLUSION:** The GPS sports watch underpredicted 5k time by approximately four minutes. The prediction from the GPS sports watch was based on factors such as speed, heart rate, and distance measured while participants wore the watch for two weeks. Failure to accurately measure heart rate at the radial pulse, inaccuracy associated with GPS, and varied training intensity while wearing the watch could explain some of the error.

**The Application Of Statistical Process Control In Athlete Monitoring: Case Study Series**

Ai Ishida, S. Kyle Travis, Jeremy A. Gentles. East Tennessee State University, Johnson City, TN. Email: aia041816@gmail.com
(No relevant relationships reported)

**The Application Of Statistical Process Control In Athlete Monitoring: Case Study Series**

Ai Ishida, S. Kyle Travis, Jeremy A. Gentles. East Tennessee State University, Johnson City, TN. Email: aia041816@gmail.com
(No relevant relationships reported)
centrifuge and subsequently analyzed for [Cl] by ion chromatography. Data are shown as mean±SD. Results: There was no difference in sweat [Cl] between Absorbent and Epifluidic patches (t=0.80, p=0.42). Bland-Altman Limits of Agreement between methods was -9.3 to 11.6 mmol/L with a mean bias of 1.2 mmol/L. There was a significant correlation between patches (r=0.92, p<0.0001) and the coefficient of determination (r²) for predicting Absorbent from Epifluidic patch [Cl] was 0.85. Based on Deming regression analysis, the slope and intercept of the regression line describing Absorbent vs. Epifluidic patch sweat [Cl] were not different than 1 and 0, respectively. Conclusions: The Epifluidic patch provides accurate data for forearm sweat [Cl] estimation during exercise in sport-specific conditions during live indoor and outdoor training. Future research is needed to evaluate the Epifluidic Patch in other sports (beyond those investigated) as well as for on-skin analysis of sweat [Cl] at other regional sites.

There is a continuous search for indirect methods and simple criteria to evaluate physiological effects of training. ECG analysis provides a relevant option for routine monitoring as it can be supported in real-time mobile or wearable device applications. Determination of the optimal ECG features is essential for monitoring and assessing systems. PURPOSE: To introduce ECG-derived aerobic index (AI) and anaerobic index (ANI) which could determine training effects and indicate subject’s metabolic state. METHODS: A healthy, physically active subject performed endurance and strength training 3 times a week. He fulfilled 53 ECG measurements using single-lead wrist-wearable device before and after 28 trainings. ECG signals were processed with detection of QRS-complex. AI and ANI were calculated as R-peak normalized to S-R complex slope and as S-T complex slope normalized to R-S slope. Correlations of AI and ANI with training load were calculated using Pearson correlation coefficient (r) with p value. RESULTS: Correlations between AI and aerobic load as well as ANI and anaerobic load were identified. The more energy was burned during training, the lower indices were registered. As shown in Figure, maximum of negative correlation between AI with aerobic load was in 60 min after training (r=-0.57, p<0.01). ANI showed negative correlation with anaerobic load (r=-0.55, p<0.01) in 30 min after training. CONCLUSION: Proposed ECG-derived aerobic and anaerobic indices showed statistically significant correlations with training load and could be used as assessed individual parameters of the degree of training in fitness and sport medicine. Figure. Dependences of ECG-derived aerobic (A) and anaerobic (B) indices on energy, burned during aerobic and anaerobic load. Correlation curves with confidence bounds (95 %).

The availability of fitness trackers has increased in recent years. These trackers claim to accurately depict Heart Rate - among other factors. However, with increased intensity, the accuracy of wearable devices was varied at values throughout all stages when compared with the ECG. PURPOSE: To examine the heart rate percentage (HR%) at the Anaerobic Threshold (AT) in order to determine the appropriate exercise intensity below or above the AT. A second goal was to assess the accuracy of different types of wearable heart rate monitors (HRMs) during a graded exercise test. METHODS: Thirty healthy individuals (n=21 male & n=9 female; aged 24.5 ± 3.5 years) participated in a single incremental exercise protocol on a cycle ergometer (CE). AT was detected through a metabolic cart by using V-slope method, which determined the point of a nonlinear increase in carbon dioxide output (VCO2) against oxygen uptake (VO2). HR was measured each minute of exercise test via two optical-based monitors (Cellular Watch [IW] & Fitness tracker [FB]) and two electrical-based monitors (traditional monitor [ECG] & heart rate monitor [PL]). Electrocardiography (ECG) was used as “Gold Standard” for comparison in this study. RESULTS: AT was reached at the mean and standard deviation (SD) of 130 ± 16 bpm. HR% at AT was observed 67 ± 8 % of HRpeak, Heart Rate Reserve Percentages (HR%) at AT were observed at 42 ± 15 % of HRpeak. Across all exercise testing stages (Stage 1 [S1], Stage 2 [S2], Stage 3 [S3], etc.), no significant differences were found in HR values between ECG and PL. The most statistical differences were found in HR between ECG and IW, (S5=p<0.018), S6=p<0.041) and S7=p<0.05, respectively. As intensity increased, FB and IW underestimated the HR values throughout all stages when compared with the ECG. CONCLUSIONS: Analysis of HR% at AT was estimated at approximately 67% of participant maximum effort as well as HR% at AT was estimated at 42%. At the light-intensity, accurate outcomes of HR values were observed from all wearable HRMs. However, with increased intensity, the accuracy of wearable devices was varied at moderate and high-intensity exercise testing. The PL had the greatest agreement with

Heart rate is easy to measure and a useful variable for determining training intensity, training status and fitness levels. The downward rate of the heart following a standardized stressor (heart rate recovery; HRR) and resting heart rate (RHR) are autonomically-mediated and can be used to detect training distress. However, confounding variables can limit the usefulness of heart rate when criteria for rate changes are not individualized, especially when applied to entire sporting teams. PURPOSE: To determine influences of sex, training status, player position and season duration have on the RHR and the HRR response following a standardized physical stressor. METHODS: Subjects were male (n=17) and female (n=26) collegiate soccer players aged 17 to 22 years. RHR (taken in the morning just after awaking) and the HRR following a 300-yard shuttle run and maximal treadmill test were collected four times during an entire season. Pearson correlation coefficient (r) with p value. RESULTS: As intensity increased, FB and IW underestimated the HR values throughout all stages when compared with the ECG. PURPOSE: To determine influences of sex, training status, player position and season duration have on the RHR and the HRR response following a standardized physical stressor. METHODS: Subjects were male (n=17) and female (n=26) collegiate soccer players aged 17 to 22 years. RHR (taken in the morning just after awaking) and the HRR following a 300-yard shuttle run and maximal treadmill test were collected four times during an entire season. Pearson correlation coefficient (r) with p value. RESULTS: As intensity increased, FB and IW underestimated the HR values throughout all stages when compared with the ECG.
ECG when compared to other devices. This might be due to the fact that both HRMs utilize a similar mechanism of measurement. The electrical-based HRM was found to be more accurate in comparison to the optical-based HRMs.

Previous studies have suggested that football players not clinically diagnosed with concussion may still demonstrate differences in balance and neurocognitive performance by end of season. Clinically this is important as it indicates the athlete with sub-clinical injuries that may contribute to long-term deficits.

**Purpose:** A pilot study to determine if non-concussive impacts sustained during normal play at NCAA Division I football practices and spring season scrimmage are sufficient to elicit detectable changes in oculomotor (OM) and balance performance.

**Methods:** 23 NCAA Division I football players were recruited to this pilot study during the 2019 spring football season. Questionnaires were used to collect demographic information. Portable virtual reality equipment was utilized to measure OM performance of smooth pursuit, saccade, and vestibular ocular reflex (VOR). BESS was utilized to measure balance performance. Assessments were administered at baseline, 24-48 hours after 3 practices, and the spring season scrimmage. Shapiro-Wilk analysis was used to assess changes in balance and OM skills in subjects across the pilot project.

**Results:** Of the 23 recruited subjects, 7 (30%) completed all assessments; however, there were missing data observations for the 7 subjects who completed all 5 assessment points. There was no significant change in balance performance ($p = 0.375$); one variable of smooth pursuit testing (mean phase error of left eye) demonstrated near significant changes ($p = 0.0625$). There was no significant change in any variables for horizontal or vertical VOR, while one variable of horizontal and vertical saccade testing (accuracy of left eye) demonstrated near significant changes ($p = 0.0625$).

**Conclusion:** We found no significant detectable changes in balance and OM performance in this pilot study.

**G-34 Free Communication/Poster - Performance**

**Board #82**  
May 30 8:00 AM - 9:30 AM  
**Effect Of Practice And Game-Related Impacts On Common Indicators Of Concussion: A Pilot Study**  
1 Tulane University School of Medicine, New Orleans, LA.  
2 Tulane University School of Public Health and Tropical Medicine, New Orleans, LA.  
3 Tulane University, New Orleans, LA.  
4 Sponsor: Dr. Gregory W. Stewart, FACSM

Email: jsimons4@tulane.edu  
(No relevant relationships reported)

**Results:** Athletes and one coach significantly predicted training effort (HR) during practice. However, the variance was small (9%) and sRPE remained steady despite decreased training load and increased QRT scores (trend) over time.

**PURPOSE:** Badminton is a racket sport characterized by high-intensity, intermittent actions. Some of the most important aspects of fitness required for badminton highlighted in the literature include speed, agility, strength, and power. Traditional strength testing such as one repetition maximum (IRM) squat can be time-consuming and inaccurate. As an alternative choice, the isometric mid-thigh pull (IMTP) has been shown to be related to performance variables such as vertical jump, strength, sprint, and agility in various sports. There are two primary variables for IMTP, the first is to quantify the athlete’s maximal force-generating capacity, known as peak force, and the second is to assess the rate at which force can be applied during a maximal effort muscle contraction, called as the rate of force development. This study aimed to examine the relationship among IMTP, vertical jump, sprint, agility and smooth performance in elite junior female badminton players.

**METHODS:** Twenty-three national level junior female badminton players (Age: 15.21 ± 0.89 y; Height: 1.71 ± 0.06 m; Body mass: 58.54 ± 6.90 kg; Training age: 7.32±1.95 y) participated in this investigation. The participants performed IMTP, vertical jump, 10-m sprint, badminton-specific change-of-direction testing, and forehead smooth velocity testing. Bivariate correlation analysis (Pearson product-moment correlations) was used to examine the relationship between IMTP kinetic variables and sprint, agility and smooth performance.

**RESULTS:** Peak force had a significant negative correlation with 10-m sprint time ($r = -.582$, $p = .004$), left ($r = -.662$, $p = .001$) and right ($r = -.664$, $p = .001$) pro-agility time. Peak force also had a significant positive correlation with smooth velocity ($r = .418$, $p = .047$) and vertical jump power ($r = .514$, $p = .012$). Rate of force development had a significant negative correlation with 10-m sprint time ($r = -.636$, $p = .001$), left ($r = -.575$, $p = .004$) and right ($r = -.546$, $p = .007$) pro-agility time, as well as a significant positive correlation with vertical jump power ($r = .534$, $p = .009$).

**CONCLUSIONS:** Results from this investigation demonstrate that IMTP variables such as peak force and rate of force development are associated with jump, sprint, agility and sport-specific performance in elite junior female badminton players.
Purpose: Obstacle course racing (OCR) has become a popular recreational activity in the last ~10 years, with more than 8.5 million participants. Despite the popularity, little is known about predictors of performance in OCR; research to date has focused on injury prevalence. The purpose of this study was to conduct laboratory and field tests of athletic performance in OCR athletes and examine their relationships to performance in a simulated OCR.

Methods: Thirty-two men and women (mean ± standard deviation (SD) age: 42 ± 10 years; OCR experience: 2.8 ± 2.3 years) completed laboratory testing for VO2max, anaerobic power (Wingate), vertical jump, flexibility, and body composition. Additional field tests were completed for 400 meter and 1 mile running time, muscle strength (back squats and deadlifts) and endurance (bucket carry for distance), grip strength, and burpees. Participants also completed a 3-mile simulated OCR. Independent t-tests examined differences between sex and bivariate regressions were conducted between testing variables and OCR performance.

Results: For the combined sample, the best individual predictors were mean relative power from the Wingate tests (β ± standard error (SE): -6.47 ± 1.12 minutes) and mile run time (β ± SE: 6.43 ± 0.71 minutes). Multivariable analysis controlling for age, sex, and mile run time found an independent association between bucket carry for distance and race time (β ± SE: -0.04 ± 0.01 minutes), but mile run time was still the best predictor (β ± SE: 6.33 ± 0.97 minutes). Conclusions: Data from the present study suggest that aerobic and anaerobic fitness have important contributions to OCR success.

Purpose: The vertical jump (VJ) test is used in athletic populations to assess lower body power and this value can be utilized as a predictor for sports performance. Incidentally, athletes have often elevated their level of performance in competitive environments. However, competition during assessment tests has not been widely examined. It is logical to assume that conducting the VJ test where subjects compete against each other may contribute to higher jumps. The purpose of this study was to determine if a competitive environment would have an impact on VJ performance in females.

Methods: Twenty-six no less than averagely fit college females (age = 21 ± 1.86 years, Ht. = 166.53 ± 7.30 cm, Wt. = 64.47 ± 11.84 kg, BPV = 23.55 ± 6.22%) completed a dynamic warm up followed by four minutes of passive recovery (PR). After the completion of familiarization jumps and a four-minute PR period, subjects completed two jump series (in a counterbalanced order, solo and competitive) consisting of six jumps per series. The competitive series consisted of two subjects jumping side by side against one another simultaneously. The highest jump, second highest jump, and average jump heights of the solo (SFHJ, SSHJ, SAJ) and competitive (CFHJ, CSHJ, CAJ) jumps were compared and analyzed using a paired-samples T-test (p < 0.05).

Results: Significant differences occurred between: CFHJ (54.61 ± 1.31 cm) and SFHJ (53.34 ± 1.27 cm) (p = 0.001); CSHJ (53.68 ± 1.32 cm) and SSHJ (52.27 ± 1.34 cm) (p = 0.001); and CAJ (52.97 ± 1.31 cm) and SAJ (51.45 ± 1.33 cm) (p = 0.001).

Conclusions: The results of this study suggest that a competitive environment for the VJ test does have an impact on VJ performance. Future research may need to assess the impact of a competitive environment on the VJ test utilizing athletes from sports where jumping actions are of extreme importance. Furthermore, an evaluation of the competitive environment on other power tests, such as the broad jump, should occur.
**3774** Board #91 May 30 8:00 AM - 9:30 AM

**Combined Driving: Task-specific Position Impacts Grip Strength Of Equestrian Athletes**

Michaela Keener, Kimberly I. Tumlin, Nicholas R. Heebner. *University of Kentucky, LEXINGTON, KY. (Sponsor: John Keener, FACSM)

Email: keene036@kentucky.edu

(No relevant relationships reported)

Equivalent to a human triathlon, combined driving is an equestrian sport designed to test ability to navigate horses and carriage during three phases. Drivers control up to four horses at a time relying heavily on hand strength. **PURPOSE:** To 1) establish baseline data on grip strength and endurance of combined drivers in standing and task-specific positions; and 2) compare grip values to normative data by driver age. **METHODS:** Selection for the study included those medically cleared to actively compete, and free from the potential of injury. Fifty-three combined drivers (29 males, 24 females) ages 21-78 participated during two nationally recognized events. All drivers were right hand dominant. 63% of drivers were over 50 y/o; 22% of drivers reported having arthritis in their hands/wrists. Drivers completed a demographics and sport-specific survey, and three grip tests in two positions: standing and task-specific (sitting). Measures included peak values and endurance. Peak grip was recorded into four categories based on normative values. **RESULTS:** Females with more than 30 yrs of driving experience had higher strength in the non-dominant hand (p=0.0345). There was a significant difference between strength based on position for both sexes (Table 1). Over 45% of females were stronger than normative data for both dominant and non-dominant hand, while only 22% of males fell in the stronger category. Female drivers average hand grip strength was 1.25 times greater than the normative population. The endurance for all subjects was significantly higher for the right hand (p=0.002). **CONCLUSIONS:** This study is the first to establish standing and task-specific grip strength in combined drivers. Female drivers over 50 y/o demonstrated greater hand strength in their non-dominant hand, suggesting continuous use of hands for driving promotes strengthening muscle and maintaining hand function regardless of reported arthritis. Results demonstrated equestrian driving is beneficial to hand grip strength.

<table>
<thead>
<tr>
<th>Average Standing Peak Right (kg)</th>
<th>Average Standing Peak Left (kg)</th>
<th>Average Sitting Peak Right (kg)</th>
<th>Average Sitting Peak Left (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>49.5 ± 5.0</td>
<td>44.6 ± 6.0</td>
<td>38.5 ± 7.0</td>
</tr>
<tr>
<td>Females</td>
<td>32.6 ± 6.5</td>
<td>30 ± 6.2</td>
<td>23.2 ± 11.5</td>
</tr>
</tbody>
</table>

Table 1. Average peak grip strength while standing and sitting by sex.

Note: Values are displayed as mean ± SD.

*denotes significant difference (p<0.05) between right and left

*denotes significant difference (p<0.05) between standing and sitting

**3775** Board #92 May 30 8:00 AM - 9:30 AM

**Differences In Player Metrics Between Lacrosse Games And Practices**

Kinta Dillon Schott, Ryan T. Connors, Paul N. Whitehead. *University of Alabama Huntsville, Huntsville, AL. (Sponsor: Don Morgan, FACSM)

(No relevant relationships reported)

Lacrosse participation in the United States has rapidly increased in recent years, however there is minimal research related to the sport. Existing research has mainly utilized laboratory-based testing procedures. There is a need to understand the physiological demands of players during live play to assist coaches with the training and conditioning necessary for improved player performance. **PURPOSE:** To compare player metrics of high school male lacrosse players during games and practices. **METHODS:** A team heart rate monitoring system with an internal global positioning system and gyroscope was used to record internal player metrics (heart rate [HR], calories) and external player metrics (duration, distance, speed, sprints). Participants in the study consisted of 13 male high school club lacrosse players (16.2 ± 1.5 yr; 175.3 ± 7.7 cm; 69.9 ± 13.6 kg). Subjects were monitored during two practices (130.9 ± 5.2 minutes) and one game (39.58 min). Differences in player metrics were compared by session, as well as by position: attack, midfield, defense, and face-off-get-off (FOGO). Game and practice data were compared utilizing paired samples t-tests, while individual position metrics were analyzed by independent sample t-tests. A standard p ≤ .05 was used to determine significance for the analyses. Effect sizes (r) were also calculated for each comparison. **RESULTS:** Significant differences and large effect sizes were found for heart rate, and caloric expenditure (r ≥ 4.2, p ≤ 0.003, r ≥ 590). Significant differences and large effect sizes were also found for duration, total distance covered, and number of sprints between game and practice sessions (r ≥ 2.32, p ≤ 0.049, r ≥ 253). Positional comparisons identified significant differences and large effect sizes between midfield and FOGO positions for maximum HR (r = 2.41, p < 0.028, r = 529) and number of sprints (r = 3.242, p = 0.005, r = 745). **CONCLUSION:** The results of the study suggest that both internal and external metric requirements differ between high school lacrosse practice and game sessions, as well as across varying positions. This data could be used to alter practice sessions to better mimic the higher intensities of games and provide coaches the ability to train athletes at game-like and position-specific intensities.

**3776** Board #93 May 30 8:00 AM - 9:30 AM

**Performance Profile Of International Male Lacrosse Players**

Richard Hauer1, Antonio Tessitore2, Harald Tschan1. *University of Vienna, Vienna, Austria. 1University of Rome “Foro Italico”, Rome, Italy.

Email: richard.hauer@univie.ac.at

(No relevant relationships reported)

**PURPOSE:** Even with its rising participation numbers worldwide, there has been little research on the physiological demands of Lacrosse players. Therefore, this study aimed to determine (a) the overall activity profile and differences over the course of play, and (b) differences between players position. **METHODS:** Data involved eight World Championships games of the male Austrian lacrosse national team using micro technological devices. Assessed parameters included total distance covered (m), mean heart rate (%HRmax) and duration of different HR-zones (HRL) (<75; 75-84; 85-89, ≥90%), distance covered (m) in five different Speed-zones (S2) (0.0-0.2; >0.2-1.8; >1.8-3.3; >3.3-5.7; >5.7-∞m/s), and mean respiratory frequency (RF). Additionally to total game values differences between quarters and positions were analyzed. Statistical significance was set at p < 0.05 and for an estimate of effects Cohen’s ES was calculated. **RESULTS:** Overall activity results show a total distance covered of 4,511.6 ±1,511.3m, a RF of 25.4 ± 7.1bpm, and a HRmax of 72.3 ± 5.1%. Greatest distance was covered in S2 (1,578.4 ±627.2m), and most of the time spent in HRZ 1 (3,028.4 ±714.2s). Comparison between quarters showed lower HRL values (p < 0.00; nPr = 0.08), more time spent in HR1 (p = 0.00; npR = 0.12) and less in HRZ 3 (p = 0.03; nPr = 0.03) and HRZ 4 (p = 0.00; nPr > 0.09), and a lower RF (p = 0.00; nPr > 0.09) over the course of play. Regarding players position, attackers showed more time spent in HRZ 2 compared to other positions (1,483.2 ±1.2s; p = 0.00; nPr = 0.69), and covered greater distance in S2 (2,275.8 ±149.4m; p = 0.01; d = 3.10 ±1.55) compared to midfielders. On the other hand, midfielders showed greater distance covered in S4 (1,334.0 ±(330.5m; p = 0.05; d = 3.32 ±1.15) compared to defenders. **CONCLUSIONS:** Players’ profile data are in agreement with recent research. Furthermore, results indicate a reduction of activity along with an increase of physical stress over the course of play. Regarding players position our findings support the hypotheses that midfielder are exposed to higher intensity bouts with longer rest periods compared to other positions. Overall, findings will be of interest for coaches and practitioners for a deeper understanding of demands players are exposed to in lacrosse match-play.

**3777** Board #94 May 30 8:00 AM - 9:30 AM

**An Evaluation Of Internal And External Load Metrics In Games In Women’S Collegiate Lacrosse**

Jennifer Bunn, FACSM, Mary Reagor, Bradley J. Myers. *Campbell University, Buies Creek, NC.

Email: bunnj@campbell.edu

(No relevant relationships reported)

**PURPOSE:** There is little published data to guide coaches and sport scientists about important variables for measuring game and training load in sports outside of soccer and rugby. The purpose of this study was to statistically evaluate the relationship of internal and external load metrics in women’s collegiate lacrosse games. **METHODS:** Twelve Division I collegiate female lacrosse players wore a heart rate (HR) monitor and global positioning system (GPS) during 17 intercollege games. Seven measures determined training load: two internal measures [mean HR and training impulse (TRIMP)] and five external measures [total distance, high-intensity distance (HID), distance rate, accelerations, and decelerations]. The training load measures were analyzed for the whole game and by first and second halves. Principal component analysis (PCA) was used to determine which internal and external load variables were most associated with each portion of the game. A paired samples t-test was used to compare differences in first and second half metrics. **RESULTS:** The whole game and each half extracted only one principal component. For the whole game, HID, decelerations, accelerations, TRIMP, and total distance...
CONCLUSIONS: These results show that a combination of internal and external load measures should be used to determine load during games. The loaded metrics should be compared to a complementary analysis for drills to ensure that training load metrics are similar. These data also support the concept of reduced high-intensity performance in the second half. This information should be used to bolster appropriate training methods to improve second half fitness.

3778 Board #95 May 30 8:00 AM - 9:30 AM
Cut-Off Values In The Prediction Of Success In Olympic Distance Triathlon
André B. Gadelha¹, Marcelo M. Sales², Marti Flothmann³, Lucas P. Barbosa⁴, Samuel S. Aguiar⁴, Rafael R. Oller⁴, Elias Villiger⁵, Petelis T. Nikolaidis⁵, Beat Knechtle⁶, Caio V. Sousa⁶. ¹Federal Institute of Education, Science and Technology Goiano, Goiânia, GO, Brazil. ²Goiás State University, Querétaro, GO, Brazil. ³University of Miami, Miami, FL. ⁴Catholic University of Brasilia, Brasília, DF, Brazil. ⁵Centro Universitário do Planalto Central Aparecidos de Santos, Gama, DF, Brazil. ⁶University of Zurich, Zurich, Switzerland. Email: andrebonadias@gmail.com

PURPOSE: To determine cut-off values to reach a Top-3 position in an Olympic distance triathlon by investigating which discipline has the most influence in overall race performance, and whether or not this has changed over the decades.

METHODS: Data from 1989 to 2018 of 33,099 men and 18,928 women (n=52,027) who competed in the Triathlon World Cup, World Triathlon Series, and Olympics race events were included. In addition to exploratory data analyses, linear regressions were applied for performance trends in overall and top-3 of each race. A t-test for independent samples was applied for sex comparison. Multivariate analysis was performed to assess which discipline may have the greater influence. The cut-off value was calculated for each discipline.

RESULTS: The cut-off values for Men were: swimming=19.5min; cycling=71.6min; running=38.1min. Based on this analysis, it was shown that running influence on overall race performance for both men and women.

CONCLUSIONS: In conclusion, the established cut-off values were set in order to increase the chances of achieving a successful rank in an Olympic distance triathlon. It is important to note that the influence of each discipline is similar and that the established cut-off values are applicable to both men and women.
RESULTS: The significant increase in LESS scores and peak vGRF between T2 and T1 groups suggests that the second landing may be more indicative of injury risk when using the LESS. Low height jumpers had greater injury risk due to significantly higher LESS scores and minimal changes in knee excursion from landing one to landing two.

3781 Board #98 May 30 8:00 AM - 9:30 AM

“Critical Oxygenation Model”: A Novel Approach To A Classical Fatigue Threshold

Andri Feldmann. University of Bern, Bern, Switzerland.

Email: andri.feldmann@ispw.unibe.ch


PURPOSE: The critical power (CP) model identifies a performance-based fatigue threshold which can be effectively used to predict time to task failure (TTF). The model’s hyperbolic form identifies a clear asymptote (CP) which determines an over-under threshold with which an athlete can perform a task. Tasks over CP result in a depletion of work potential (W’) which ultimately results in failure when W’ is depleted. CP and W’ are performance characteristics and the physiological mechanism behind this phenomenon remain difficult to pinpoint. Nonetheless, performance above CP is characterised by unsustainable metabolic process which are a potential explanation for failure. A physiological measure that could represent CP and W’ would enhance the model’s effectiveness for athletics. Muscle oxygenation (SmO2) as measured by Near-infrared spectroscopy (NIRS) offers itself as a potential physiological surrogate for CP and W’, through a time-SmO2 integral (O’) identifying unsustainable metabolic process.

METHODS: Eighteen participants (age: 21±1.7; weight: 68.1±1.1 kg) performed three trials of single-leg knee extensions, at 5%, 10% and 20% 1-RM, to exhaustion in order to evaluate individual power-duration curves. In order to eliminate the effect of blood flow knee extension trials were performed in occluded conditions (pressure cuff = 300mmHg). NIRS and EMG sensors were placed on the vastus lateralis, vastus medialis and rectus femoris. O’ of the NIRS curve that could represent CP and W’ would enhance the model’s effectiveness for athletics. Muscle oxygenation (SmO2) as measured by Near-infrared spectroscopy (NIRS) offers itself as a potential physiological surrogate for CP and W’, through a time-SmO2 integral (O’) identifying unsustainable metabolic process.

RESULTS: The CP model predicts that W’ is constant across tasks to failure. The same prediction was made for O’. The results suggest that this assumption is correct and O’ remains constant for TTF; 5% 1-RM: M = 43.85, SD = 17.93, [95% CI: -35.3, -52.5]; 10% 1-RM: M = 44.75, SD 17.76, [95% CI: -36.2, -53.3]; 20% 1-RM: M = 44.79, SD 16.16, [95% CI: -37.0, -52.5]. CONCLUSIONS: SmO2 represents a dynamic balance between CP and W’.

3782 Board #99 May 30 8:00 AM - 9:30 AM

Effects Of Different Intensity And Duration Of Warm-up On Hemodynamics, Jump Power, And Flexibility.

Imtiaz Masfique Dowlah, Ezra Meza, Amanda Hanks, Orlando Cepeda, Klarissa Ybarra, Brenda Palma, Brianna Lopez, Manuel Nunez, Alexandra Hinojosa, Ulku Karabulut, Murat Karabulut, FACSM. University of Texas Rio Grande Valley, Brownsville, TX.

Email: imtiazmasfique.dowlah01@utrgv.edu

(No relevant relationships reported)

PURPOSE: Tabata protocol (TP), usually consisting of eight to nine bouts of 20-sec of maximal exercise with 10-sec rest, is time-efficient intervention with both aerobic and anaerobic benefits. This study investigated the effectiveness of different variations of TP as a warm-up procedure.

METHODS: Twenty-five healthy subjects (13 females and 12 males) participated in this study. Participants performed 6 randomized exercise sessions separated by at least 48 hours. The exercise sessions involved 3-min (TP3-20:10), 5-min (TP5-20:10), TP3-30:10 or 8-min (TP8-20:10; TP8-30:10) consecutive bodyweight squats of either 20-sec workout with 10-sec rest (20:10) or 30-sec workout with 10-sec rest (30:10). Heart rate (HR), blood pressure (BP), thigh skin surface temperature (TT), vertical jump performance (VJ), and flexibility (F) were measured before and after execution of the protocols. Countermovement jump was used to measure VJ and sit-and-reach test was used for measuring F.

RESULTS: Two-way ANOVA demonstrated significant condition*time interaction (p<0.01) and time main effect (p<0.01) for F. Significant condition*time interaction (p<0.01) and condition*time effect (p<0.01) and time main effects (p<0.01) were observed for HR. There were significant main effects for time with the post-test demonstrating higher values than the pre-test values for both SBP and DBP (p<0.01). Significant time main effect (p<0.01) was also noted for TT indicating reduction in TT following exercise bouts.

CONCLUSIONS: The findings are suggestive of a decrease in F following a higher duration of exercise (TP8-20:10 and TP8-30:10). This may be ascribed to greater accumulation of metabolites (lactic acid, ammonia, and hydrogen ion) in the working muscles, which may alter Type III and IV afferent neural activity to increase pain perception. Local tissue acidosis also stimulates bradykinin release, which may contribute to the transmission of nociceptive signals from skeletal muscle. Additionally, higher duration of exercise may increase control level that decreases the pain threshold level. Therefore, the decreases in flexibility may be explained by one or a combination of metabolic, hormonal, and neurobiological changes stimulating the brain to inhibit the muscular response.

3783 Board #100 May 30 8:00 AM - 9:30 AM

Is Better Freestyle Swimming Technique Associated With Better Performance?

Travis R. Pollen1, David Ebaugh2, Jason H. Mohring2, Sheri P. Silfies3. 1Drexel University, Philadelphia, PA. 2University of Delaware, Newark, DE. 3University of South Carolina, Columbia, SC. (Sponsor: Clare Milner, FACSM)

Email: trp59@drexel.edu

(No relevant relationships reported)

Swimming technique is widely believed to influence performance, but few studies have quantified this relationship using an objective, pool-side technique assessment. PURPOSE: To determine the relationship between freestyle swimming technique and swimming performance using a poolside technique assessment. METHODS: Freestyle swimming was assessed for technique errors during normal practice near the beginning of the season in 27 Division III college swimmers (16 females, 19±1 years, 1.75±0.11 m, 71.0±10.4 kg). Seven freestyle swimming techniques were considered errors: (1) hand crossing the midline of the body at entry, (2) straight-arm recovery, (3) hand entering with the thumb first, (4) inadequate or excessive shoulder roll, (5) hand crossing the midline of the body during the underwater pull-through, (6) elbow dropping during the pull-through, and (7) excessive neck flexion/extension. Six of the errors were assessed bilaterally, resulting in a maximum possible score of 13 errors.

Swimming performance was determined by each participant’s best freestyle event from the end-of-season meet as a percentage of the conference record. The correlation between errors and performance was assessed with Pearson’s r. One participant was removed due to a late-season injury that affected their ability to train and compete.

RESULTS: Participants averaged 2.7±1.7 errors (range: 0-5). Their performance averaged 93.9±5.6% of the conference record (range: 87-99%). There was a significant negative correlation of moderate strength between number of errors and performance: r = -0.59, p = 0.01, R2= 0.35 (Figure). Fewer errors corresponded with better performance. CONCLUSION: The fewer freestyle technique errors a swimmer made, the faster their best freestyle race time was as a percentage of the conference record. Technique explained 35% of the variance in performance. This study is one of the first to demonstrate this relationship using objective, pool-side assessment criteria.
Vibration Frequencies On Muscular Function And Vertical Jump Performance

Jonathan Tyler Gonzalez, Imitiaz Masifique Dowllah, Gualberto Garza, IV, Nancy Calle, Galilea Chapa, Julissa Perez, Jose M. Sosa, Liana Chee, Ulku Karabulut, Murat Karabulut, FACSM. University of Texas Rio Grande Valley, Brownsville, TX.

Email: jonathan.gonzalez0@utrgv.edu

(NO relevant relationships reported)

PURPOSE: To determine the acute effects of different whole-body vibration (WBV) frequencies and squat depths on lower extremity isometric and isokinetic muscle function and vertical jump performance.

METHODS: Thirteen healthy male (age = 23.8 ± 5.3 years) and fifteen healthy female subjects (age = 22.45 ± 3.04 years) performed six randomized sessions of vibration protocols (VPs) in different squat positions with 90° (low-squat) and 140° (high-squat) knee flexion angle at 30 Hz (30Hz90°; 30Hz140°), 40 Hz (40Hz90°; 40Hz140°) & 50 Hz (50Hz90°; 50Hz140°). Each subject performed 5 sets x 1-min of static squats with 30-sec rest between each set. Then they rested for 5-min and repeated 5 more sets. Once completed, vertical jump performance was measured. Furthermore, subjects were tested for maximum 5-sec right knee extensor isometric contractions at 60° of knee flexion, and isokinetic concentric knee extension and flexion at 180/sec, utilizing standard Biodex protocol. All VPs were performed on the same commercial side to side alternating vibration platform and foot placement for all squats was recorded to ensure consistency.

RESULTS: Two-way repeated measures ANOVA indicated a significant condition main effect in average jump height (p<0.01) and average jump time (p<0.001), demonstrating enhanced jump performance following 40Hz140° (p<0.05) and 30Hz140° (p<0.01) compared to 50Hz90°. A significant condition main effect was found in peak-torque during the isokinetic test, where observed changes were greater for both 30Hz140° and 40Hz140° compared to 30Hz90° (p<0.05) and 50Hz90° (p<0.01). Lastly, the best performance on peak-torque during the isometric test was significantly higher after 30Hz140° (p<0.05) and 40Hz140° (p<0.05) compared to 30Hz90°.

CONCLUSIONS: The findings are suggestive of greater muscular strength and explosive power production following a high-squat WBV warm-up compared to low-squat WBV warm-up. This can be attributed to augmented muscle fatigue and/or increased muscle length due to the plasticity of skeletal muscle while performing low-squat WBV warm-up, resulting in impaired ability to produce muscular force.

The vertical jump (VJ) test is often used in sport and recreational performance sectors. Prior studies have examined the effects that anthropometric and body composition values have on VJ performance in no less than averagely fit populations. Yet, it appears that no study has evaluated the relationship between body fat percentage (BF), body mass index (BMI), lean leg mass (LLM), and trunk lean mass (TLM) on VJ performance using collegiate female volleyball players. PURPOSE: To assess the relationship between BF%, BMI, LLM, and TLM on VJ performance in collegiate female volleyball players. METHODS: After having descriptive data recorded, 12 female collegiate volleyball players had their BF%, BMI, LLM, and TLM assessed via dual-energy x-ray absorptiometry. Subjects had their reach height measured, prior studies have examined the effects that anthropometric and body composition values have on VJ performance in collegiate female volleyball players. PURPOSE: To assess the relationship between BF%, BMI, LLM, and TLM on VJ performance using collegiate female volleyball players. METHODS: After having descriptive data recorded, 12 female collegiate volleyball players had their BF%, BMI, LLM, and TLM assessed via dual-energy x-ray absorptiometry. Subjects had their reach height measured, participating in an 8 min dynamic warm-up, were then given a 4 min passive recovery (PR) period after the warmup, and then completed three familiarization jumps (ie. trials) using a VJ measurement device. After another 4 min PR period, subjects completed one series of six jumps with 30 secs of PR between each jump. Pearson Correlations were then performed between BF%, BMI, LLM, and TLM (ie. the highest of the six jumps) with significance differences determined at p<0.05. RESULTS: A non-significant low negative correlation existed between BF% and VJ (r = -0.350, p = 0.132), yet a non-significant low correlation occurred between BMI and VJ (r = 0.371, p = 0.117), TLM and VJ (r = 0.265, p = 0.202), and LLM and VJ (r = 0.372, p = 0.117). CONCLUSIONS: BF% appears to have a low negative relationship with VJ performance in collegiate female volleyball players, while BMI, LLM, and LLM have a low relationship with VJ performance. Having a lower BF% may not necessarily predict higher jumping performance in collegiate female volleyball players. Further research may be required to determine if gender, fitness level, or a different type of body fat percentage measurement technique may play a factor when considering if BMI, BF%, LLM, and TLM have a low correlation with VJ performance in athletes who specialize in sports with repetitive jumping movements.

CARDIOVASCULAR exercise is known to exert a variety of positive physiological and psychological benefits on neurocognitive function, glucose and fatty acid metabolism, and muscle recovery. Many of these effects are thought to be mediated by brain derived neurotrophic factor (BDNF), a neurotropin produced both centrally and peripherally. The fate of BDNF during prolonged endurance exercise is unknown and may be implicated to mitigate potential negative consequences to ultra-endurance racing.

PURPOSE: To investigate the effects of a three-day ultra-endurance triathlon on serum BDNF concentrations pre- and post-race. METHODS: Twenty triathletes (age: 40 ± 8.8 yrs) who competed in the 2015 (N=13 men, 3 women) and 2017 (N=3 men, 1 woman) UltraMan Florida triathlon participated in the present study. Blood samples were collected 24-36 hrs pre-race and within 12 hrs post-race. Serum BDNF levels were measured via ELISA. A paired sample t-test was used to evaluate differences between pre- and post-race BDNF concentrations. Values are reported as mean ± SD with significance accepted as p<0.05. RESULTS: BDNF significantly increased from pre- to post-race (0.17 ± 0.9 pg/mL vs. 0.23 ± 0.14 pg/mL; +9.6%; p<0.05). CONCLUSIONS: For the first time, BDNF is shown to significantly increase after a three-day ultra-endurance race. These findings may indicate that BDNF concentrations are elevated to potentially counteract any negative consequences derived from ultra-endurance exercise. The influence of both duration and intensity of exercise on BDNF concentrations need to be further elucidated due to its array of positive implications on cognitive and physical function and recovery from prolonged endurance exercise. Supported by the International Society of Sports Nutrition and Florida State University.
**Purpose:** Triathlon combines three sports (swimming, cycling, and running) into a single race and, because triathletes must cycle after the swimming, it is important to understand how cycling power may be affected by prior swimming. Therefore, the purpose of this study was to determine the effects of a 2-km swim at a self-selected race pace intensity on the cycling power-duration relationship measured during a 3-min all-out cycling test (3MT).

**Methods:** Eighteen trained triathletes (12 M, 6 F; 37.1 ± 10.6 years, VO_{2max} 54.8 ± 10.1 ml·kg⁻¹·min⁻¹) performed two 3MTs on separate days with one 3MT immediately following a 2-km swim (swim-bike; SB) and one without prior swimming (bike only; BO). The power-duration relationship was expressed as the total work done and subdivided into the end-test power (EP) and work done above EP. To assess swimming intensity, heart rate (HR) was continuously monitored during the swim and blood lactate was assessed immediately following the 2-km swim.

**Results:** End-swim lactate was 4.2 ± 1.8 mM and mean swimming heart rate was 147 ± 18 bpm. The 2-km swim decreased total work done during the 3MT by 6% (BO: 281 ± 65 W; SB: 269 ± 68 W; p = 0.102) nor work done above EP (BO: 12.1 ± 3.8 kJ; SB: 10.5 ± 4.2 kJ; p = 0.096) differed between trials. Peak power was also assessed during the 3MT and did not differ between trials (BO: 552 ± 142 W; SB: 541 ± 147 W; p = 0.097). The change in EP was inversely correlated to the change in work above EP (r = 0.624; p = 0.006). **Conclusions:** Total work done while cycling decreases following a 2-km race (4.2 ± 1.8 mM) and although neither EP nor work above EP changed significantly. Triathletes may want to determine race cycling power following swimming because prior swimming affects performance during the 3MT. Future studies should look at how different swim pacing strategies affect the cycling power-duration relationship.

**3789**

**Board #106**
May 30 8:00 AM - 9:30 AM
**Predicting Success In NCAA Division I Football Linemen Based On Physical Performance Test Results**

Charles Shaner1, Mike Gentry2, Anthony Caterisano, FACSM1, Michael J. Caterisano1, Furman University, Greenville, SC. 3Virginia Tech, Blacksburg, VA. (Sponsor: Anthony Caterisano, FACSM)

**Purpose:** The purpose of this study was to identify performance variables that predict success among aspiring Division I (D-I) college football Linemen. **Methods:** Archival data were analyzed from 403 college football linemen, which focused on their best physical test results, who played during a period from 1987-2015 at a highly ranked NCAA D-I university. Players were categorized by position either as offensive linemen (OL; n=246) or defensive linemen (DL; n=157). Data were collected at various intervals throughout each athlete’s playing career, and included personal best measures in height (HT), body mass (BM), 1 repetition maximum (1RM) in the squat (SQ), bench press (BP), power clean (PC), push jerk (PJ), vertical jump (VJ), and sit and reach test (SR), 40-yard dash (40YD), 10-yard dash (10YD), and 20-yard shuttle (20YS). All data were collected by the same Head Football Coach in the same football program.

**Results:** The statistically significant predictors by position were as follows: for OL, BM (P<0.01), BP (P<0.01), PC (P<0.05) and 40YD (P<0.01); for DL, BM (P<0.05), 40YD (P<0.05) and VJ (P<0.05). **Conclusions:** These results suggest that it may be possible to predict the success of NCAA Division I football linemen in the positions tested, by looking at selected performance parameters. Our data suggests that for OL a large body mass combined with speed, upper body strength and explosive hip extension is important. For DL, a large body mass combined with speed and lower body power are good predictors of success.

**3790**

**Board #107**
May 30 8:00 AM - 9:30 AM
**Predicting Success In NCAA Division I Football Skill-players Based On Physical Performance Test Results**

Michael J. Caterisano1, Charles Shaner1, Mike Gentry2, Anthony Caterisano, FACSM1, Furman University, Greenville, SC. 3Virginia Tech, Blacksburg, VA. (Sponsor: Anthony Caterisano, FACSM)

**Purpose:** The purpose of the study was to identify performance variables that predict success among aspiring Division I (D-I) college football skill-position players. **Methods:** Archival data were analyzed from 712 college football skill-position players, which focused on their best physical test results, who played during a period from 1987-2015 at a highly ranked NCAA D-I university. Players were categorized by position either as offensive skill-position players (OSP which includes running backs, quarterbacks and wide receivers; n=311); defensive backs (DB; n=157); or linebackers, tight ends and fullbacks (LTFEB; n=244). Data were collected at various intervals throughout an athlete’s playing career, and included personal best measures in height (HT), body mass (BM), 1 repetition maximum (1RM) in the squat (SQ), bench press (BP), power clean (PC), push jerk (PJ), vertical jump (VJ), and sit and reach test (SR), 40-yard dash (40YD), 10-yard dash (10YD), and 20-yard shuttle (20YS). All data were collected by the same Head Football Coach in the same football program.

**Results:** The statistically significant predictors by position were as follows: for OSP, VJ (P<0.01), PC (P<0.05), and 40YD (P<0.01); for DB, BM (P<0.05), and 40YD (P<0.01); and for LTFEB, BM (P<0.05), 40YD (P<0.01), and PJ (P<0.05). **Conclusions:** These results suggest that it may be possible to predict the success of NCAA Division I football skill-position players. Data were analyzed using ordinal regression analysis. For OSP, lower-body power and explosive hips combined with speed are important; for DB it’s large body mass combined with speed; and for LTFEB, explosive hips combined with body size and speed are important.
Physical Demands Of Professional Golf Caddy: A Case Study

Jinideliu1, AnthonyP. Turner2, StanleySai-chuenHui, FACSМ1.
1TheChineseUniversityofHongKong,HongKong.HongKong.
TheUniversityofEdinburgh,Edinburgh,UnitedKingdom.
Email:jindieliu@link.cuhk.edu.hk

Few studies have investigated the physical demands of golf caddying during high-level golf competitions, yet recent fatalities have raised questions regarding demands relative to physical fitness. PURPOSE: The purpose of this study was to examine the physical demands of a professional golf caddy during a single round of a European Tour Tournament. METHODS: A professional male golf caddy with 27 years of caddying experience (age = 47 years, HRmax = 161 bpm, VO2max = 29 ml/kg/min) volunteered for this study. During the first round of 2018 Irish Open, the caddy wore a global positioning system (GPS) device and a heart rate (HR) monitor continuously throughout the round of golf for the recording of displacement and HR responses, respectively. RESULTS: The total time (TT) of the round was 226 min with 53.5% walking and 46.5% standing, and the total distance covered by the caddy was 8.63 km, with mean and peak traveling speeds of 2.3 km/h and 9.7 km/h, respectively. The mean HR was 110 bpm (68.3% HRmax), with a peak of 136 bpm (85.4% HRmax). The caddy spent most (62.3%) of the TT at moderate intensity (64−77% HRmax). ACSM’s guidelines, 2013), 27.5% of the TT at light intensity (50−64% HRmax), and only 10.2% of the TT at high intensity (77−94% HRmax). In general, uphill movements elicited a higher HR response. CONCLUSIONS: These results suggest that cardiovascular demands of golf caddying were primarily moderate intensity activity during the round of elite golf. However, high intensity activity was also observed when the caddy climbed hills continuously. These findings may provide useful information for justifying the need for aerobic training programs for a professional golf caddy, relative to a low current cardiovascular fitness level.

Table 1: Weight, FMS, and MAPS scores pre and post (mean ± SE)

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Assessment</th>
<th>Body mass (kg)</th>
<th>FMS</th>
<th>MAPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aikido</td>
<td>Pre</td>
<td>76.5 ± 4.9</td>
<td>14.6 ± 0.4</td>
<td>47.8 ± 2.1</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>77.4 ± 4.6</td>
<td>15.5 ± 0.5 *</td>
<td>51.9 ± 9.3 *</td>
</tr>
<tr>
<td>BJJ</td>
<td>Pre</td>
<td>70.9 ± 2.6</td>
<td>15.1 ± 0.4</td>
<td>46.5 ± 1.7</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>71.2 ± 2.5</td>
<td>14.9 ± 0.3</td>
<td>48.3 ± 2.0</td>
</tr>
<tr>
<td>Yoga</td>
<td>Pre</td>
<td>64.3 ± 2.4</td>
<td>14.4 ± 0.4</td>
<td>43.1 ± 1.6</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>65.1 ± 2.6</td>
<td>15.5 ± 0.4 *</td>
<td>48.8 ± 1.7</td>
</tr>
</tbody>
</table>

* p ≤ 0.05

CONCLUSION: Twelve weeks of Aikido or yoga exercises improved functional movement. Brazilian Jiujitsu did not have a significant impact on functional movement.

Effect Of Aikido, Brazilian Jiujitsu, And Yoga On Functional Movement


PURPOSE: To identify the impact of Brazilian Jiujitsu (BJJ), aikido and yoga on functional movement. METHODS: One hundred seven college students completed 22 fifty-minute sessions of one of 3 possible modes of exercise (aikido- N=31, BJJ- N=W- & yoga- N=38) over a 12-week period. Aikido is a throwing and pinning martial art that focuses primarily on standing movements. BJJ is a movement based martial art that focuses primarily on standing movements. Yoga is a movement based practice that focuses on flexibility. The functional movement assessment included (FMS) and Mobility, Activation, Posture, and Symmetry (MAPS) assessments were administered at baseline and following 12 weeks of exercise participation to evaluate the parameters of the power-duration relationship (i.e., critical power, CP; curvature constant, W') derived from the performance of two 3 min all-out tests (3MT) separated by 60 s passive recovery. We aimed to: 1) to establish the effect of a prior 3MT on CP and W'; 2) examine whether current models accurately predict inter-bout W' reconstitution; and 3) determine the physiological factors that are related to W' reconstitution. METHODS: We analysed 19 datasets from 17 participants (ages, 22 ± 3 years; body mass 82.2 ± 13.6 kg) who took part in two separate studies, and 10 datasets have previously been published (Black et al. 2018 Front Physiol. 9:11). Datasets included a ramp incremental test and the performance of two 3MT separated by 60 s passive recovery. Paired samples t-tests were used to assess differences in: peak power; end test power (EP, indicative of CP); work performed above/below a 1st end test power (W-E1-P2, EP-W); and; total work done (T), between bouts 1 and 2. Reconstitution of W' between exercise bouts was estimated using: the intermittent CP model (CPint); a differential equation (W(bal)int); and, a continuous integrating equation (W(bal)con). Differences between the actual and predicted reconstitution of W' were evaluated using paired samples t-tests and limits of agreement were determined via Bland-Altman analyses. RESULTS: EP and W-E1-P2 were significantly reduced in bout 2 compared to bout 1 (Bout 1: EP 273 ± 43 W, W' 17.0 ± 3.3 kJ; vs. Bout 2: EP 258 ± 39 W, W' 4.3 ± 2.8 kJ, both P<0.05). The W' reconstitution was significantly overestimated (P<0.05) and was not significantly correlated with the predictions provided by the CP model (r=0.46, r<0.02) or the W'(int) model (r=0.2, r<0.02). Inter-bout W' reconstitution correlated with relative VO2peak (r=0.66, P=0.002) and power output at the gas exchange threshold (r=0.57, P=0.012). CONCLUSIONS: The power-duration relationship (i.e., CP and W') is adversely impacted by prior all-out exercise, and current models do not adequately describe the subsequent rate of W' recovery. These results have important implications for the design and use of mathematical models describing the energetics of exercise performance.

Effects Of Exercise Modality And Structure On Physiological And Perceptual Responses To Exercise

Gregory C. Bogdanis1, Vasiliki J. Mallios1, Christos Katsikas1, Theodora Fouski1, Todd A. Astorino, FACSМ2, Caitlin Smith2, Iain Holman2.
1National and Kapodistrian University of Athens, Greece, Athens, Greece. 2California State University-San Marcos, San Marcos, CA. (Sponsor: Todd A. Astorino, FACSМ)
Email: bgdavis@ursinus.edu

PURPOSE: To examine the effects of exercise modality (cycling vs. running) and structure (continuous vs. interval exercise) at an individualized exercise intensity, on physiological and perceptual responses. METHODS: Seven healthy young individuals (3 M and 4 F, age = 21 ± 1 years) performed four 20 min trials in random order: continuous cycling and running (MICT) at an intensity corresponding to 80% of the individual ventilatory threshold (VT) and intermittent cycling and running (HIIT) including 10 x 1 min bouts at 120% VT, with 1 min active recovery at 60% VT. Blood lactate concentration was measured at rest, midway during exercise and 3 min after exercise, while VO2, heart rate (HR) and rating of perceived exertion (RPE) were measured continuously. Data were analysed using 3-way repeated measures ANOVA. RESULTS: VO2max (40.0 ± 5.8 vs. 36.0 ± 5.3 ml/kg/min, p<0.001) and VT (70.8 ± 7.6 vs. 51.4 ± 4.2 %VO2max, p<0.001), were higher in running than cycling. This resulted in energy expenditure being highest in HIIT and MICT during running (217 ± 47 and 199 ± 61 kcal, respectively, p<0.001) and lowest in HIIT and MICT during cycling (142 ± 19 and 142 ± 17 kcal, respectively). Average HR was higher in running versus cycling (159 ± 15 and 138 ± 9 bpm, p=0.008) and in HIIT versus MICT.
The standing long jump (SLJ) is intensively used in fitness preparation as a measure of lower limb power. The SLJ has also been shown to be related to maximal sprint speed. The power deployed during a SLJ can be calculated, but it is unknown what the effect of body weight has on the relationship between sprint speed and power. PURPOSE: Explore the relationship between a 20m sprint and the SLJ under 5 loading conditions (0%, 1%, 3%, 10%, and 15% of bodyweight). METHODS: Anthropometric measures (n=13) were taken prior to testing sessions (Age: 16±0.7 years; Height: 180±10.0 m; weight: 90±20.0 kg). The loads used during different loading conditions were confirmed using a bodyweight scale (Omron, Canada). SLJ distances were measured from toes (starting line) to the closest heel using a jump mat (Javy Sports, Singapore). Peak power (PV), peak power (PP) and relative power (RP) to body weight were measured using a linear transducer (TENDO SPORTS MACHINES, London, UK) for each loading condition. The protocol consisted of 2 sprints of 20m with 3 minutes of recovery between sprints. The best of 2 completed attempts per loading condition was retained same for the best sprint time. The time at 10m and 20m were measured with photocell timing gates (Brower Timing System, Utah, USA). Linear regressions and paired Pearson correlations were calculated (SPSS Ver 26). RESULTS: Multiple significant (p<0.05) correlations were observed (r=0.573 to 0.892). Findings show significant (p<0.05) correlations were observed (r=-0.859) with a load of 15% and 15% respectively were significantly correlated with the 10m during sprint time. (r=-0.635) with a load of 3%, and SLJ distance (r=-0.573, r=0.736) with a load of 10% and 15% respectively were significantly correlated with the 10m during sprint time. Also, PV (r=-0.635) with a load of 3%, and SLJ distance (r=-0.573, r=-0.736) with a load of 10% and 15% respectively were significantly correlated with the 10m during sprint time. CONCLUSION: Weighted SLJ using 15% of bodyweight is better correlated to 10m or 20m sprint times than a standard SLJ. We propose different formulas to predict peak velocity, 10m and 20m sprint time all based on SLJ distance. Peak velocity (m/s) = (Distance (m) x 2.50) – 0.88 R

CONCLUSIONS: Running, especially in the form of HIIT at an intensity close to VT, results in greater energy expenditure, while blood lactate and fatigue are increased. Precaution must be taken with the current data, as some subjects had as many 40 repetitions at 85%, which is not congruent with that percent 1RM. The current DWU protocol seems to have possibly decreased performance due to fatigue. Further studies should use a multi-set approach with a resistance trained population approach to better determine its efficacy.

Testing programs may be individualized to the particular needs and preferences of the exerciser. Controlling training and exercise characteristics, such as morning versus night, may alter exercise-related outcomes. PURPOSE: The purpose of this project was to investigate metabolic and perceived exertion outcomes during maximal runs at ends of the day (early morning and late-night) following a standardized, pre-run meal. METHODS: Thirteen participants (females: 8, males: 5; age: 20±7;1.4 yrs, BMI: 24.9±3.0 kg/m²) volunteered to complete two, randomized maximal runs, separated by 24-72 hours (condition 1: 06:00-09:00 and condition 2: 21:00-02:00). The starting
treadmill speed (perceived effort of 12-13 on the Borg 6-20 RPE) for each condition was determined during a familiarization trial. Pre-run nutrition was standardized with the consumption of a yogurt-drink prepared based on each individual’s body mass and activity level (approximately one-quarter of their total daily calories as 80% carbohydrate, 3% fat, and 17% protein). Drinks were ingested 2 hours prior to the testing. During the maximal runs, speed was maintained at the previously described intensity, and grade was increased 2% every 2 minutes until volitional fatigue. Metabolic data were gathered via a metabolic cart using a 15-breath moving average. Paired sample t-tests were used to compare appropriate data with significance accepted at p<.05. Total fat oxidation during the tests was derived from VO2 and RER.

RESULTS: The morning and night runs lasted 10.2±2.3 and 9.9±2.6 minutes, respectively. No statistical difference was found between morning and night runs for relative VO2(max) (47.0±7.0 vs. 47.3±8.0 ml/kg/min, p=.721), total fat oxidation (24.8±6.7 vs. 27.7±22.3 kcal, p=.597), or maximal RPE (18.9±1.5 vs. 18.6±1.5, p=.794).

CONCLUSIONS: Relative VO2(max) total fat oxidation, and RPE did not differ between maximal runs performed early morning and late-night. Running maximally at ends of the day may not elicit any differences in these variables among a group of younger, recreationally active adults provided a standard, pre-run meal.

Although Pilates improves flexibility, balance, and posture of symptomatic elderly or sedentary middle-aged adults, there has been little focus on studying the effect of Pilates in young athletes. PURPOSE: This study aimed to examine whether Pilates exercise improve core stability and joint flexibility in college athletes.

METHODS: Fifteen healthy college students (control group) and 15 female college athletes (athlete group) participated in this study. Each student engaged in a 30-min Pilates session with a licensed instructor once a week over 12 weeks. The Functional Movement Screen (FMS) was used to evaluate core stability and joint flexibility before and after this intervention. The FMS focuses on seven fundamental movements: shoulder mobility (SM), hurdle step (HS), in-line lunge (ILL), active straight leg raise, trunk stability push up, rotary stability (RS), and deep squat. A repeated-measures ANOVA was performed to compare the groups (control group vs. athlete group).

RESULTS: Although there were no significant between-group differences, the results indicated significant main effect for the Pilates intervention (F=62.5, p< 0.001, ηp=0.82), Pilates intervention × FMS interaction (F=35.6, p< 0.001, ηp=0.72), and FMS (F=2519.6, p< 0.001, ηp=0.99). After 12-week intervention, SM (before: 2.37 ± 0.2 vs. after: 2.73 ± 0.1, p < 0.05), HS (before: 2.30 ± 0.1 vs. after: 2.70 ± 0.1, p < 0.01), ILL (before: 2.10 ± 0.1 vs. after: 2.40 ± 0.1, p < 0.01), RS (before: 2.13 ± 0.1 vs. after: 2.63 ± 0.1, p < 0.001), and total score (before: 16.17 ± 0.4 vs. after: 18.13 ± 0.3, p < 0.001) had significantly improved.

CONCLUSION: Pilates exercise is effective for improving FMS scores, strengthening core stability, and flexibility for healthy controls and college athletes. Supported by JSPS KAKENHI Grant Number JP18K10973.

Effect of Eccentric Overload Training on Change of Direction Performance: A Meta-analysis

Raidong Liu, Jianxun Liu. Tsinghua University, Beijing, China. Email: lrd5156@hotmail.com

-0.53, -0.05; I2 = 97.5%) shorter than that in the control group. There was no evidence of publication bias based on the Egger’s test and Begg’s test.

CONCLUSIONS: EOT was found effective in improving COD performance. Future studies should adopt a randomized experimental design, recruit large and representative samples from professional team sports, and examine the effect of EOT on various measures of COD performance among population subgroups.

Table 1 Results from meta-analysis and publication bias tests

<table>
<thead>
<tr>
<th>Mea- sure</th>
<th>First author, year</th>
<th>Pooled effect size (95% CI)</th>
<th>Model</th>
<th>Publication bias test</th>
<th>P-value for Egger’s test</th>
<th>P-value for Begg’s test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall COD task</td>
<td>Contrella, 2019; Sanchez-Sanchez, 2019; Chaabene, 2019; Siddle, 2019; Coratella, 2018; Maroto-Izquierdo, 2017; Bourgeois, 2017; Tous-Fajardo, 2016; de Hoyos, 2015; Lockie, 2014</td>
<td>98.8%</td>
<td>-0.34 (-0.49, -0.19)</td>
<td>Random-eff ect</td>
<td>0.15</td>
<td>0.48</td>
</tr>
<tr>
<td>160° COD task</td>
<td>Contrella, 2019; Siddle, 2019; Bourgeois, 2017; Gonzalez-Skok, 2017</td>
<td>97.5%</td>
<td>-0.24 (-0.53, -0.05)</td>
<td>Random-eff ect</td>
<td>0.26</td>
<td>1.00</td>
</tr>
<tr>
<td>T-test task</td>
<td>Contrella, 2019; Chaabene, 2019; Coratella, 2018; Maroto-Izquierdo, 2017; Lockie, 2014</td>
<td>98.7%</td>
<td>-0.81 (-1.31, -0.11)</td>
<td>Random-eff ect</td>
<td>0.55</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Research has demonstrated the effects of music on exercise performance such as heart rate, cadence, and rate of perceived exertion. Specifically, music tempo is considered a significant factor influencing physiologic changes and is measured in beats per minute (bpm). The preference for music with fast tempos may be due to a stimulus that increases physiological arousal. However, results have differed depending on population, exercise modality, and experimental protocol. PURPOSE: The purpose of this study was to determine the differences in heart rate and pedal frequency on a cycle ergometer with and without music. METHODS: Participants (N=20) were collegiate level students who were recreationally active and met physical activity standards. Each participant completed two 20 minute cycle sessions, one while listening to a predetermined music playlist and the second without any music. The predetermined music playlist included 4 songs at tempos of 77 bpm, 132 bpm, 82 bpm, and 126 bpm. Participants pedaled at a self-selected frequency. Heart rate and pedal frequency were recorded for each minute of exercise. A paired T-Test was used to determine statistical significance between variables (p<0.05). Analysis of Variance was also used to determine statistical significance between heart rate and music tempo (p<0.05) RESULTS: Results from this study show average heart rate with music at 140 ± 15.7 bpm and without music 130 ± 15.7 bpm. Pedal frequency averaged 62.7 ± 10.7 and 57.8 ± 7.5 revolutions with music and without respectively. There was a statistically significant difference between heart rate (p<0.01) and pedal frequency (p<0.01) from music to no music. A statistically significant difference in heart rate was observed between the music tempo groups, F = 24.51, p = 0.001, with a large effect size, η2 = 0.304. Bonferroni post-hoc tests indicated the heart rates for 77 bpm (126 ± 19), 132 bpm (140 ± 16), and 82 bpm (145 ± 17) was significantly higher than each other (p<0.01). CONCLUSION: The results indicate that music increased heart rate and pedal frequency significantly compared to no music. Additionally, there was a significant difference in music tempo on heart rate. The results from this study support the notion that music does increase physiologic changes during exercise.
CONCLUSION: These findings illustrated the importance of ring finger pinch strength on climbing performance in a bouldering competition. Our results also suggested that increasing climbing experience and frequency of training may contribute to greater ring finger pinch strength and overall climbing performance.

PURPOSE: The purpose of the present study was to determine the relative contributions of handgrip and individual finger strength, body size, climbing experience, and training habits for the prediction of climbing performance in a bouldering competition.

METHODS: Sixty-seven climbers (males: n = 46; females: n = 21; mean age ± SD = 21.1 ± 4.0 yrs; body mass = 69.5 ± 9.8 kg; height = 173.5 ± 8.3 cm; climbing experience = 2.7 ± 2.6 yrs; climbing frequency = 3.0 ± 1.2 sessions w/k) volunteered for this study. Data collection occurred immediately before an indoor bouldering competition and involved the assessment of handgrip and individual finger maximal force production using an electronic handheld dynamometer. Individual finger strength was defined as the maximal force generated using a tip-to-tip pinch between each finger and the thumb. All measures of strength were normalized to body mass (kg). Subjects also completed a questionnaire to determine climbing experience and training habits (i.e. climbing frequency). The bouldering competition consisted of 70 routes graded V0 (easiest) - V8 (most difficult) with higher point values awarded for routes completed in the shortest time.

RESULTS: The results indicated there were significant β-weights showed that ring finger pinch strength (β = 0.430) was the most significant contributor followed by climbing experience (β = 0.331) and climbing frequency (β = 0.244).

CONCLUSIONS: The VDOT Calculator may underestimate VO2max for males (d = .94, p = .01) and female (d = 0.94, p = .025), but minimal research exists on the role of the coach in predicting success in a coach-supervised versus self-supervised competition plan performed significantly better across all performance metrics (p < .001). However, between-groups differences scores were significant for females compared to males on BP (4.4% vs 3.1%, p = 0.001), and a near significant difference for PT (2.6% vs 2.2%, p = 0.070). Relative changes were similar between sexes for BS (3.3% vs 2.9%), DL (3.3% vs 3.4%), and WS (2.5% vs 2.2%). CONCLUSIONS: Consistent performances were expected considering the caliber of poweredlifters. Importantly, the data from this study indicate that changes greater than ~1% on COMP lifts are meaningful in raw poweredlifters. However, it is apparent for female poweredlifters, the limiting factor for maintaining or improving national level performance may be BP. Thus, female poweredlifters and their coaches may consider emphasizing BP training to improve consistency in COMP.

PURPOSE: To compare the rates of success in coach- versus self- supervised performance at the USA Powerlifting Collegiate National Championships from 2016-2019. Methods: Using a repeated measures ANOVA design with specific post-hoc analysis, 88 members of the powerlifting team at a United States Service Academy were individually tracked on their performances at the annual USA Powerlifting Collegiate National Championships from 2016-2019. Performance metrics included: number of successful and non-successful attempts, total weight lifted, and Wilks total (a relative strength metric used in powerlifting).

RESULTS: A total of 88 competitions were tracked over the duration of this investigation. Successful attempts (7.9±1.2 vs. 5.4±1.2), total weight lifted (530.2±146.9 kg vs. 416.8±235.0kg), and Wilks total (408.9±86.0 vs. 352.3±186.7) were significantly greater in the coach-supervised versus self-supervised population. Lifters following a coach-supervised versus self-supervised competition plan performed significantly better across all performance metrics (p < .001).

Conclusion: The coach plays a significant role in determining performance outcomes during powerlifting competition. An abundance of research exists on the importance of a coach in developing long-term, periodized strength training for improving strength outcomes, but minimal research exists on the role of the coach in predicting success in individual competitions. These findings support the notion that supervisory mentorship is integral to the success of athletes during both training and competition.
The Impact Of Sleep Deprivation On Agility Performance And Pattern Recall

Caroline Albright, Laura Lupin. Chestnut Hill College, Philadelphia, PA.
Email: albrightc@chc.edu

(No relevant relationships reported)

PURPOSE: With sleep having the potential to affect both memory and physical performance associated with learning and performing sport related tasks, this study sought to determine the effects of sleep deprivation and college athletes on their ability to remember and perform agility drills similar to that which would be performed in practice or game. METHODS: Ten physically active college athletes (21-26 years) participated in the study (5 males and 5 females). Participants were tested under two conditions, 2-4 hours and 7-9 hours of overnight sleep. The night before each test day, participants were instructed in detail about a four-part agility pattern they had to remember and perform the following morning. The agility drill included: forward sprinting, back pedaling, in and out box stepping drills, Icky Shuffle, and a vertical jump. Each test day participants performed a warm-up and then the agility drill three times. They rated their perceived exertion (RPE) for each trial, and the best time for each drill was used for analysis. RESULTS: Completion speed was not significantly different after 2-4 hours sleep (26.9 ± 2.9 sec) compared to 7-9 hours sleep (26.1 ± 2.6 sec). RPE was also not significantly different for 2-4 hours sleep (8.4 ± 2.2) compared to 7-9 hours sleep (7.9 ± 1.3). There was also no gender difference for speed or RPE. However, participants who were instructed to undergo 2-4 hours of sleep for their first test took significantly longer to perform the drill for the first testing day compared to those who received 7-9 hours of sleep for their first testing day, taking on average 2.2 ± 1.7 sec longer. CONCLUSION: Although no difference was seen overall in agility performance times when comparing prior sleep, there was a difference in performance times when comparing the ordering of learning a new task. Learning a new agility pattern when sleep deprived first resulted in slower agility times than when seeing the new pattern for the first time with a full night sleep. Physically active college students are at risk of decreased performance times for drills they are seeing for the first time on minimum sleep. Coaches often stress getting good sleep prior to competition but may be important for adequate sleep prior to practice sessions where new play routes are being taught.

The Acute Effects Of External Pneumatic Compression On Anaerobic Performance And Blood Lactate Concentration

Email: drbat55@hotmail.com

(No relevant relationships reported)

The use of External Pneumatic Compression (EPC) among athletes as a recovery modality is rising. However the evidence supporting efficacy of EPC on recovery and performance is limited and it thus warrants for further investigation. PURPOSE: To determine the acute effects of EPC on anaerobic performance and blood lactate (BLa) concentrations following a fatigue protocol. METHODS: In a randomized, counterbalanced cross-over study design, 10 healthy university male athletes, aged (25.2 ± 1.1 yrs), were recruited to complete 3 experimental sessions with two 30-seconds trials of maximum effort Wingate Anaerobic Test (WAnT)(T1 & T2) on a cycle ergometer with a constant load of .075 kg per kilogram of body mass, separated by a 20-min recovery period where either passive recovery (PR), active recovery (AR) or EPC treatment were administered. BLa levels, heart rate and ratings of perceived exertion were recorded. Power output in Watts (PO), fatigue index (FiT) and total work in Joules(TW) were examined.

RESULTS: Mean power output (MP) in Watts following AR (T1: 634.90 ± 81.18, T2: 638.06 ± 99.98)mp<.022) and EPC (T1: 642.55 ± 78.38, T2: 637.85 ± 95.62)mp<.020) were significantly higher than PR (T1: 623.21 ± 91.08, T2: 620.38 ± 103.03). However, MP between AR and EPC treatment were not significant (p=.567). Similarly, TW were significantly higher following AR treatment (T1: 19.09 ± 2.54, T2: 19.02 ± 2.97)mp<.028 and EPC treatment (T1: 19.41 ± 2.33, T2: 19.04 ± 2.83)mp<.013 than PR (T1: 18.58 ± 2.73, T2: 18.47 ± 3.03) but mean differences were minimal between AR and EPC treatment. PO (PR T1: 954.90 ± 206.78, T2: 980 ± 178.42, AR: T1: 1001.00 ± 187.16, T2: 928.50 ± 172.46, EPC: T1: 970 ± 135.71, EPC: T2: 943.00 ± 152.58)mp<.481 and Fi (PR T1: 62.23 ± 17.05, T2: 57.40 ± 15.98, ER T1: 64.80 ± 17.41, T2: 59.42 ± 17.76, EPC: T1: 63.40 ± 18.03, T2: 56.86 ± 15.15)mp<.780 were not significant. BLa concentration decreased significantly from peak BLa at 5 minute post-WAnT to 20 minutes post-WAnT in all trials (PR: p<.000, AR: p<.000, EPC: p<.000). However the mean difference in BLa (mmol/L) levels at 20 minutes after WAnT and 5 minutes post-WAnT were 2.6 in PR, 4.0 in AR and 2.7 in ECP. CONCLUSIONS: Results indicated performance was better maintained with the use of EPC and AR. Therefore, the use of EPC may be a feasible alternative method when static recovery is desired.
Physical performance in field hockey (here on referred to as hockey) is determined by many different factors. Recently, the development of small wearable inertial measurement units (IMUs) has provided new possibilities to profile the physical demands in different team sports, especially in the high intensity events (HIEs) aspect of competition and training.

**PURPOSE:** The aim of this study was to profile the position-specific HIEs in elite female hockey matches with the use of IMUs.

**METHODS:** Sixteen matches analyzing 22 elite Chinese female hockey players (height: 168.5±4.6 cm, body mass: 62.4±5.3 kg) were recorded by using IMUs (OptimEye S5, Catapult Sports, Australia) during the 2016-2017 Chinese national competition season. Players were categorized in three different playing positions: strikers, midfielders and defenders. An official speed (MS), PlayerLoad™ (PL), accelerations (Acc), decelerations (Dec), changes of direction (CoD) and the sum of last three HIEs, were extracted from raw-data files using the manufacturer’s software (OpenField, version 1.14.0). All Acc, Dec, CoD and HIEs > 2.5 m/s² were analyzed. Data were reported as mean±SD. Multiple paired t-test was used to compare data between different positions. Significance was set at P≤0.05.

**RESULTS:** Average attractiveness was 3.78 ± 0.6 (range, 2.7-5.2) and 3.68 ± 0.6 for male and female subjects, respectively. There was a negative correlation between attractiveness and personal best performance in male sprinter events. However, there was no relationship between attractiveness and personal best performance in male sprinter events.

**CONCLUSIONS:** To examine the relationship between attractiveness and personal best performance in male sprinter and personal best performance in female sprinter events. However, there was no relationship between attractiveness and personal best performance in male sprinter events.
The act of overhead throwing is a series of complex tasks that require synergy between multiple joint and muscle groups, lack of this synergy may lead to a decrease in performance and injury over time. In recent years, Kinesio tape has gained popularity as a tool to improve performance and reduce injury. The purpose of this study was to investigate the effects of Kinesio Tape on throwing velocity, accuracy and range of motion, and angle of ball release after the application of Kinesio Tape. METHODS: A randomized crossover design, subjects were either allocated to the control group (no treatment) or the Kinesio Tape group. RESULTS: Heterogeneity was examined using the Q statistic and inconsistency using I². The overall results suggest that SC and R feedback improve performance during the acquisition phase, with greater improvements observed for SC feedback. SC feedback had no significant change during the retention phase, while R feedback decreased performance. These findings suggest that SC feedback may be the better choice for enhancing motor skills.

Successful pitching in baseball may be due to a number of factors including the mechanics of the motion, the strength, power, flexibility of the athlete, as well as their intent and fatigue levels. The pitching motion is a very powerful, violent, complex and abnormal range of motion of the body. In recent studies, it has been widely evidenced that the ability to produce instantaneous high peak force outputs is related to success in sport. Therefore, the ability to produce higher peak force may be related to the ability to pitching in baseball. Mouthguards have been shown to significantly increase power production in a number of dynamic exercise movements. PURPOSE: The purpose of this study was to determine if maximal and average pitching velocity could be increased when wearing a mouthguard. METHODS: Twenty-two male collegiate baseball pitchers participated in this study (age: 19.9 years old ± 1.4 years, body mass: 87.1 kg ± 11.6 kg, body height: 182.5 cm ± 6.1 cm). All study participants were competitive athletes at the NCAA Division 1, Division 3, or University Varsity Club level. Results: Pitching velocity changes resulted in a mean increase of 0.732 km/h for all groups. Velocity change for each level tested resulted in mean increases of 1.652, 0.402, and 0.370 km/h for the university club, Division 3 and Division 1 levels, respectively. The results of a paired samples t-test analysis showed that there was a statistically significant improvement when using a mouthguard in pitching velocity across all groups combined; t(109) = 2.958, p = 0.004. Further, university club level pitchers experienced a statistically significant improvement; t(29) = 5.972, p = 0.000; while Division 3; t(39) = 0.772, p = 0.445; and Division 1; t(43) = 1.014, p = 0.317; players did not show a statistically significant improvement with the mouthguard. Conclusion: The authors found that a mouthguard may improve throwing velocity in male collegiate baseball athletes. These findings could be useful to both coaches and sport performance specialists who are working with pitchers to bring about increases in power output and subsequent increases in pitching velocity, simply by implementing the use of a mouthguard.
Vertical displacement is a vital component of success in many power sport activities including volleyball and basketball. The Vertical Jump test (VJ) is a common, easy to use measure of power production applicable to many athletic populations. Treatments or preparations, such as Percussive Massage (PM), and Foam Rolling (FR) have been introduced to warm up routines on the premise that they will enhance power output and performance. Purpose: The purpose of this study was to assess vertical jump performance following a warm up of one of three treatments, including no massage (N), FR and PM. Methods: 11 male and 7 female recreationally active college age students (age: 23.4± 3.7 yr., height: 171.6 ± 11.4 cm, body mass: 68.2 ± 15.8 kg.) volunteered to participate in a randomized single-blind crossover design study. Three trials of 3 VJ separated by 2 minutes between jumps were conducted. During the 2 minutes of rest, an intervention (N, FR, or PM) was administered. For both FR and PM, treatment was administered bilaterally for 30 seconds per muscle group (Gluteus Maximus, Hamstrings, Quadriceps, and Gastroc/Soleus) for a total of 2 minutes. Vertical jump height was recorded after each jump using a standard vertical jump tester. Results: Statistical analysis by ANOVA (P<.05) revealed no significant difference (NSD) between best jumps. The best jumps for N, FR, and PM were 54.11± 2.5 cm, 54.96 ± 2.3 cm, and 54.05 ± 2.7 cm, respectively. In addition, subjects were very consistent among the first, second, and third trials across all conditions. (NSD). Conclusion: The results of this study suggest that neither percussive nor non-percussive massage improve or detract from vertical jump performance and the use of either as a pre vertical jump warm-up may be an individual choice. Supported, in part by a grant from Theragun®.

Percussive massage tools (PMT) have recently become a topic of interest in the realms of fitness, wellness, pop culture, and athletics. PMT are designed to be implemented during warmups, pre-competition, and recovery processes. Little is known about the warm-up effects of these relatively new tools on muscular power. Purpose: The purpose was to determine the efficacy of a PMT aided warm-up on Wingate Anaerobic Power Test (WAPT) performance. Methods: 20 college-aged subjects (16♂, age 22.6 ± 2.8 yr., height 176 ± 8.4 cm, body mass 78.6 ± 15.4 kg.) volunteered to participate in the WAPT following familiarization and 3 randomly assigned warm-up protocols. All warm-up protocols began with 3 minutes of cycling at 50 watts. The cycling was followed by: 2 minutes of (PMT) on the lower extremity, 2 minutes of foam rolling on the lower extremity (FR), and no intervention (C). The Wingate Test was performed at 100% body mass on a Lode cycle ergometer. ANOVA with repeated measures was used to analyze these data (P<.05). Results: PP-Peak Power (watts) and MP-Mean Power(watts) were: PMT 1328 ± 368 & 640 ± 173, FR 1139 ± 284 & 623 ± 155, and C 1183 ± 386 & 634 ± 160, respectively. PP was significantly higher following PMT than both FR 189 (+16.6%) and C 145 (+12.2%). There were no significant differences in MP among trials. Fatigue index (FI) of (PMT: 80.8 ± 9.6% FR: 77.7 ± 11.9% C: 76.1 ± 9.3%)*, PMT FI was 4.7%* higher than C. Blood lactate values obtained 3 minutes post WAPT were not significantly different among the trials and were as follows: PMT 10.9 mmol ± 2.3 mmol, FR 11.2 mmol ± 2.7 mmol, and C 11.0 mmol ± 2.1 mmol. Conclusion: A PMT aided warm-up may be an effective means of improving PP production and possibly performance in acute power-based events lasting 30 seconds or less. The greater FI of PMT may be partially attributed to the significantly greater PP. Supported, in part by a grant from Theragun®.

The effectiveness of techniques to enhance joint range of motion including static and dynamic stretching, have been studied for more than 50 years and is well documented. However, there is a paucity of research on the effect of a new percussive massage technique on flexibility. Percussive massage provides a machine generated series of rapid movements over specific areas of the body with a variation in both the depth and speed of percussion. Purpose: The purpose of this study was to assess the effect of percussive massage (PM), static stretching (ST) and no massage (NM) on low back and hamstring flexibility. Methods: 30 subjects (age 22.4 ± 2.2 yr., height 174.2 ± 8.6 cm., weight 75.6 ± 14.2 kg., BMI 24.6 ± 4.3 kg/m²) volunteered to participate in this single blind, crossover study. Subjects reported to the lab on three separate days in a resting state. Pre sit and reach measurements were taken immediately upon arrival. Thereafter, they participated in randomly assigned interventions of PM, ST, and NM. PM performed on both hamstrings and gluteal muscles simultaneously, 30 seconds at each muscle origin, muscle belly and insertion; total time of 90 seconds on each muscle. Static stretching consisted of a seated unilateral hamstring stretch and a supine unilateral leg cross-over stretch both held for 30 seconds. Following each intervention, post sit and reach measurements were obtained. A maximum of two minutes separated all pre and post- test measurements. Results: Mean pre and post-test Sit and Reach measures (cm) were: 29.2 ± 8.1 and 31.6 ± 7.9, 28.7 ± 2.8 and 31.5 ± 7.8, and 28.6 ± 7.8 and 30.8 ± 8.1 for PM, ST, and NM, respectively. Statistical analysis by repeated measures ANOVA at p<.05, was applied to assess post-intervention differences. (The changes) (cm) between pre- and post-interventions were 2.4 ± 2.8, 2.8 ± 2.9, and 1.5 ± 1.5 for PM, ST, and NM, respectively. A significant difference was evident between ST and NM (P < .004), with NSD (p>.05) between PM and ST and PM and NM. Conclusion: PM and ST elicited similar, acute improvements in low back and hamstring flexibility. Supported, in part by a grant from Theragun®.

Purpose: While Self Natural Posture Exercise, SNPE, widely practiced in Korea is claimed to be effective, it has not been systematically demonstrated. This study examined whether SNPE is effective in pain, functional movement, and fitness improvement. METHODS: Twenty four women with chronic pain at least last 3 month prior to study participated (27.5±5.8 yrs, 23.0±3.8 kg/m²) and were divided into two groups; SNPE group (EG; n=12) and non-exercise group (NG; n=12). Subjects in EG participated in 12 weeks of exercise program consisted of 60 min per session, twice a week, those in NG did not. Those in EG were tested before and after the program, and those in NG were tested twice in the same time interval. The pain perception was evaluated by Short-Form McGill Pain Questionnaire (MPQ). Movement tests were performed using Functional Movement Screen (FMS). Physical fitness was evaluated by grip and lower back strength, sit-and-reach, and back extension. RESULTS: Pain perception in EG was decreased (pre; 9.5±7.2 vs. post; 3.5±2.8), and group difference was noted (p<0.05). Hurdle step in EG increased (1.0±0.0 vs. 1.6±0.4, p<0.05), and group difference was noted (p<0.05). Inline lunge both in EG (4.0±6.6 vs. 2.6±0.4, p<0.001) and in NG (1.5±0.5 vs. 2.2±0.7, p<0.001) increased. Shoulder mobility in EG increased (1.9±0.7 vs. 2.9±0.2, p<0.001), and group difference was found (p<0.05). Active straight leg raise in EG increased (2.7±0.4 vs. 3.0±0.3, p<0.001), and group difference was noted (p<0.05). Rotary stability both in EG and NG did not show pre and post trial differences, but group differences were noticed (p<0.05). FMS total score both in EG (11.4±1.5 vs. 15.4±1.7, p<0.001) and in NG (12.1±1.7 vs. 13.2±2.0, p<0.05) increased, and group differences were noticed (p<0.05). Strength parameters were not changed. Push up in EG (2.7±0.4 vs. 3.0±0.3, p<0.001) increased, and group differences in both were noticed (p<0.05).
CONCLUSIONS: It is demonstrated that SNEP is a valuable exercise modality to release pain perception, to improve functional movement, and to enhance flexibility in women experiencing chronic pain.

3822 Board #139 May 30 8:00 AM - 9:30 AM Relationship Of Body Composition, Cutaneous Body Temperature & Muscle Power Of Lower Limbs In Folk Dancers

Luis Andrés Téllez1, Juan Camilo Acevedo2, Sulma Jimena Torres3, Oscar Eduardo Muñoz4, Jhonatan Camilo Peña5.

1Universidad Santo Tomás, Tunja, Colombia. 2Universidad Santo Tomás, seccional Tunja, Tunja, Colombia. 3Fundación Universitaria del Área Andina, Bogotá, Colombia.

Email: luis.tellezt@usantoto.edu.co

No relevant relationships reported

PURPOSE: Scientific evidence establishes that the practice of physical exercise increases the cutaneous body temperature, but the relationship with muscle power and body composition in dancers has not been established. METHODS: Twenty healthy professional dancers (11 men) and (9 women) participated in this study. The 20 dancers participated in a normal dance session (1 hour duration). Body composition was measured with electric bioimpedance BC-601FS FitScan evaluating Weight; P Body fat%; P Body water%; P Muscle mass; P Daily Caloric Intake; P Metabolic age; P Bone mass P Visceral fat. Muscle power was evaluated with DMJump jumping platform, Evaluating the Bosco Ergo Jump Protocol including (Squat Jump (SJ); Squat Jump with extra weight (SJ+); CounterMovement Jump (CMJ); Abalakov Jump (ABK); Drop Jump (DJ) calculating the elasticity index: elastic energy and the upper limbs muscle index. The cutaneous body temperature was measured by infrared thermography before the session and during a session of 15, 30, and 60 minutes and 5 minutes after the session. The temperature was evaluated in the anterior tibial muscle of the lower limbs is inversely related to the muscular power R = 0.76 (p <0.05).

RESULTS: There is a direct relationship between muscle mass and cutaneous body temperature increases the cutaneous body temperature, but the relationship with muscle power and body composition in the different indoor regions increased during exercise and then returned to its basal state. It is evidenced that there is a direct relationship between muscle mass and cutaneous body temperature R = 0.91 (p <0.01). There is an inverse relationship between% fat and body temperature R = -0.89 (p <0.1). The behavior of the cutaneous body temperature in the lower limbs is inversely related to the muscular power R = -0.76 (p <0.05).

CONCLUSIONS: The findings found in the present study establish the importance of the management of body composition and muscle power in cutaneous body temperature. In the future, the impact of dance on ligament and muscle structures can be measured with repeated measures analysis of variance (for CMJ) or Friedman’s test (for V1.0 and V0.8). Associations among A variables were quantified with Pearson’s correlations.

RESULTS: Squat V1.0 was significantly reduced at 24 (median ± interquartile range, 0.95 ± 0.07 m s-1, p = 0.04) and 48 (0.93 ± 0.11 m s-1, p = 0.03) post-RT. Squat V0.8 was also significantly reduced at 24 (0.70 ± 0.09 m s-1, p <0.01) and 48 (0.75 ± 0.04 m s-1, p = 0.03) post-RT. CMJ height was significantly reduced at 24 (mean ± standard deviation, 33.66 ± 5.20 cm, p = 0.02) but not 48 h (34.51 ± 5.12 cm) relative to pre-RT (36.50 ± 5.26 cm). No significant associations (all p <0.05) were observed between ∆CMJ and ∆V1.0 or ∆V0.8 at 24 r = -0.06 - 0.29 or 48 h r = 0.17 - 0.37 post-RT.

CONCLUSIONS: Recovery of CMJ performance did not parallel recovery of barbell squat performance. CMJ height should not be used to predict daily barbell squat performance.
CONCLUSIONS: The administration of sodium bicarbonate positively impacted the performance of the surfer athletes, leading to a maximum paddle time test improvement and an increase of the blood lactate.

## RESULTS

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Bicarbonate</th>
<th>Placebo</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lactate</td>
<td>14,83±2,7</td>
<td>16,43±3,1</td>
<td>0,04</td>
</tr>
<tr>
<td>Maximum time</td>
<td>10,68±0,8</td>
<td>10,88±0,6</td>
<td>0,05</td>
</tr>
<tr>
<td>Shots</td>
<td>16,35±5,2</td>
<td>16,35±5,2</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 1: Description of the Student’s-t-test, of mean and standard deviation of lactate values; maximum time; and number of shots in relation of the use of bicarbonate and sodium chloride (placebo). The accepted significance level was p≤0.05.

CONCLUSIONS: Laboratory measures indicated a heterogenous group of athletes, as demonstrated by the range of maximal oxygen uptake values (VO2max, range: 26.3 - 69.8 ml·kg⁻¹·min⁻¹). LASSO models identified that demographic factors were the most influential predictors of laboratory variables, with sex (76±37% inclusion), age (55±27% inclusion) and height (55±40% inclusion) featuring consistently in bootstrap samples across outcomes. In contrast, non-censorable patters were identified for training factors. When training factors did appear consistently in a model, the regression coefficients were small and median estimates of the best training predictors were equal to 15.1±7.4% of sex or 30.6±14.5% of the next most influential demographic factor. CONCLUSIONS: Self-reported training variables were poor predictors of physiological and performance measures in a heterogenous group of cyclists, while demographics such as sex, age, and height were greater predictors of the test variables. A lack of a properly structured or implemented training program might explain the low predictive ability of training variables towards these laboratorial outcomes.
The analysis was made in a global way and by modalities (swimming, cycling and running). A global performance index (GPI) and a specific performance indexes were created for the triathletes for each modality: swimming performance index (SPI), cycling performance index (CPI) and running performance index (RPI). Afterwards, we calculated the correlation between the stages and made a regression with the overall performance as an independent variable and the relative performance in each stage (SPI, CPI and RPI) as dependent variable. In the regression analysis, we used the “Enter” method to force the entry of all the dependent variables.

RESULTS: The final equation to evaluate the Global Performance was: GPI = (0.324 x SPI) + (0.871 x CPI) + (1.07 x RPI). When the correlation between the stages was analyzed, we observed a negative correlation between SPI and RPI (r = 0.403). This finding contradicts most of the studies that put cycling as the crucial stage in a long term triathlon race like IRONMAN®.

CONCLUSIONS: This results can confirm that in triathlon races, being a good swimmer can be very important, despite the swimming stage be less representative. In general, the running stage is the most important of the race, based in the analysis of the correlation between the 3 modalities. Running is crucial, but this analysis is very complex, because the 3 stages are not independent as far as the effort made in one stage tends to impact the performance on the next one.

**Purpose**
To examine the acute effects of yoga performed on a vibration platform (VP) with and without blood flow restriction (BFR) on locomotor muscle oxygenation, flexiblity, and voluntary activation.

**Methods**
Eighteen cyclists (age: 25 ± 6 years, 10 males, 8 females) performed an incremental ramp test, then three constant-load cycling trials to task failure (110, 90, and 80% of maximum ramp test power [Pmax]). Critical power (CP) and the curvature constant (W) of the power-duration relationship were subsequently calculated and constant-load experimental trials were performed to task failure at 110% CP, and to task failure or for 60 mins at 90% CP, whichever occurred first. Near-infrared spectroscopy of the vastus lateralis (VL) and pulmonary gas exchange were monitored during exercise, and neuromuscular function assessed before and after experimental trials.

**Results**
Males had a greater Pmax (362 ± 29 vs. 241 ± 42 W, P < 0.001) and VO2max (60.5 ± 8.2 vs. 44.2 ± 4.8 mL·kg·min−1, P < 0.001) vs. females. In absolute units, CP (260 ± 28 vs. 179 ± 32 W, P < 0.001) and W (18.5 ± 4.8 vs. 12.7 ± 3.2 kJ, P < 0.001) were greater in males, but when expressed relative to Pmax, no differences existed (P ≥ 0.209). There was no sex difference in time to task failure at 110% CP (752 ± 329 vs. 681 ± 277 s, P = 0.645), but throughout the trial, females experienced a smaller decrease in VL oxygenation (−20 ± 7 vs. −7 ± 4%, P < 0.001), and a smaller post-exercise reduction in twitch force (−35 ± 17 vs. −15 ± 10%, P = 0.010) compared to males. During the 90% CP trial, three males and three females reached task failure prior to 60 mins (mean duration: 3073 ± 835 vs. 2937 ± 964 s, P = 0.758). Females demonstrated a smaller decrease in VL oxygenation (−21 ± 9 vs. −1 ± 6%, P < 0.001), as well as a lesser reduction in twitch force (−24 ± 11 vs. −10 ± 11%, P = 0.020) and voluntary activation (−9 ± 6 vs. −4 ± 3%, P = 0.036) post-exercise compared to males. Cortisol (−20 ± 32%, P = 0.039) and sodium (−22 ± 45%, P = 0.039) excitability were reduced following the 90% CP trial, but no sex difference existed (P ≥ 0.132).

**Conclusions**
No sex difference exists in the power-duration relationship when data are expressed relative to Pmax. However, females demonstrated a greater fatigue resistance of the knee-extensors during both severe and heavy intensity cycling, likely due to lesser reductions in locomotor muscle oxygenation during exercise.
Osteoarthritis (OA) is among the most prevalent and debilitating chronic diseases worldwide affecting the general population as well as athletes. Despite that, no therapies have been proven to modify disease progression or to be highly effective for symptomatic relief, other than joint replacement surgery. Accordingly, recent efforts have been aimed to define a classification of OA phenotypes for the purpose of better identifying individuals at higher risk of progression and to better delineate subpopulations attributable to distinct risk factors and disease mechanisms that may be suitable for targeted treatment and prevention strategies. Purpose: To characterize using the Dell’Isola criteria, the frequency of knee OK (KOA) phenotypes (6 in total) in new patients presenting to a single tertiary care institution. Methods: Following IRB approval, patients were phenotyped by the senior author (TMB) at their initial clinic visit. Kellgren-Lawrence (K-L) readings were evaluated by the senior author and verified by a board certified MSK radiologist. Results: We successfully characterized 242 patients (30 - 70 years of age) with the Dell’Isola system. Due to requirements to classify five phenotypes (chronic pain, inflammatory, metabolic syndrome, mechanical overload, minimal joint disease). The most common phenotype was minimal joint disease (30% or 73 patients) followed by metabolic syndrome (19% or 45), mechanical overload (15% or 36), chronic pain (15% or 36), and inflammatory (6.3% or 15). For both the minimal joint disease and chronic pain phenotypes, there was unequal distribution of Latino to non-Latino subjects (70% vs. 30%). Discussion: OA is a complex disease increasingly recognized to be a disorder of multiple phenotypes. This study begins to phenotype a culturally and ethnically diverse population of patients with KOA in an academic Sports Medicine clinic. Ongoing investigations include validated functional evaluation (KOOS, WOMAC) of our subjects to determine if certain phenotypes are associated with poorer functional outcomes. Reference: Dell’Isola A et al. MJBrmd. Identification of clinical phenotypes in knee osteoarthritis: a systematic review of the literature. 2016: 17(1): 425.
Epidemiology Of Sudden Death In Organized School Sports In Japan

Yuri Hosokawa1, Rebecca L. Stearns3, Yuki Murata1, Miwako Suzuki-Yamanaka1, Douglas J. Casa, FACSM, 1Waseda University, Tokyo, Japan. 2University of Connecticut, Storrs, CT. 3Nagoya University, Nagoya, Aichi, Japan. (Sponsor: Douglas J. Casa, FACSM)
Email: yur hosokawa@waseda.ac.jp
(No relevant relationships reported)

There are approximately three-million four-hundred thousand registered student athletes in middle and high school in Japan. Despite a large number of participants, health and safety policies for student athletes in Japan are at its infancy and there is a paucity of data-driven policies to reduce catastrophic and fatal injuries from sports.

PURPOSE: Describe the epidemiology of sudden death in organized school sports in Japan. METHODS: Data submitted to Japan Sport Council (JSC) Injury and Accident Mutual Aid Benefit System between 2005-2016 were retrieved from JSC website for analysis (n=1,137). Case information on fatal incidents occurred during organized school sports in middle and high school students were extracted for further analysis (n=198). Descriptive statistics related to information about activity type, sex, sport, diagnosis, and presence of on-site trained medical personnel were calculated using frequency and proportion. Sudden death incidence rates were expressed per 100,000 athlete-years and 95% confidence intervals (CI). RESULTS: Fatalities were reported in practice (n=120/198, 60.6%), scrimmage (n=16/198, 8.1%), game (n=10/198, 5.1%), training camp (n=16/198, 8.1%), and other (n=36/198, 18.2%). The average incidence rate of sport related fatality was 0.39 death per 100,000 athlete-years (95% CI= 0.31-0.47). Most fatalities were in male student athletes (n=149/162, 92%), which yielded to 7.5 times greater fatality rate in male than female student athletes (male, 0.60 death per 100,000 athlete-years, 95% CI= 0.46-0.73; female, 0.08 death per 100,000 athlete-years, 95% CI= 0.03-0.13). Baseball (n=25/162, 15.4%), judo (n=24/162, 14.8%), soccer/futsal (n=20/162, 12.3%), and basketball (n=18/162, 11.1%) accounted for 53.7% of fatalities. Sudden cardiac death (n=68/162, 42.0%), head trauma (n=32/162, 19.8%), and heat related injury (n=25/162, 15.4%) were the top three diagnosis of fatality. Only three cases (2%) reported of having trained medical personnel on-site at the time of incident. CONCLUSIONS: Sports-related fatality among Japanese student athletes was highest in male baseball players during practice due to sudden cardiac death. Almost no incidents had trained medical personnel on-site at the time of the catastrophic injuries during school organized athletics in Japan.

Figure 1. APGM Sports Specialization Comparison in NFL and MLS

Figure 2. %MI Sports Specialization Comparison in NFL and MLS

Conclusion:
Adolescent MS specialization contributes to a reduction in injury predisposition in NFL athletes but not in MLS athletes.

Board #156 May 30 8:00 AM - 9:30 AM
Epidemiology Of Sudden Death In Organized School Sports In Japan
Yuri Hosokawa1, Rebecca L. Stearns3, Yuki Murata1, Miwako Suzuki-Yamanaka1, Douglas J. Casa, FACSM, 1Waseda University, Tokyo, Japan. 2University of Connecticut, Storrs, CT. 3Nagoya University, Nagoya, Aichi, Japan. (Sponsor: Douglas J. Casa, FACSM)
Email: yur hosokawa@waseda.ac.jp
(No relevant relationships reported)

There are approximately three-million four-hundred thousand registered student athletes in middle and high school in Japan. Despite a large number of participants, health and safety policies for student athletes in Japan are at its infancy and there is a paucity of data-driven policies to reduce catastrophic and fatal injuries from sports.

PURPOSE: Describe the epidemiology of sudden death in organized school sports in Japan. METHODS: Data submitted to Japan Sport Council (JSC) Injury and Accident Mutual Aid Benefit System between 2005-2016 were retrieved from JSC website for analysis (n=1,137). Case information on fatal incidents occurred during organized school sports in middle and high school students were extracted for further analysis (n=198). Descriptive statistics related to information about activity type, sex, sport, diagnosis, and presence of on-site trained medical personnel were calculated using frequency and proportion. Sudden death incidence rates were expressed per 100,000 athlete-years and 95% confidence intervals (CI). RESULTS: Fatalities were reported in practice (n=120/198, 60.6%), scrimmage (n=16/198, 8.1%), game (n=10/198, 5.1%), training camp (n=16/198, 8.1%), and other (n=36/198, 18.2%). The average incidence rate of sport related fatality was 0.39 death per 100,000 athlete-years (95% CI= 0.31-0.47). Most fatalities were in male student athletes (n=149/162, 92%), which yielded to 7.5 times greater fatality rate in male than female student athletes (male, 0.60 death per 100,000 athlete-years, 95% CI= 0.46-0.73; female, 0.08 death per 100,000 athlete-years, 95% CI= 0.03-0.13). Baseball (n=25/162, 15.4%), judo (n=24/162, 14.8%), soccer/futsal (n=20/162, 12.3%), and basketball (n=18/162, 11.1%) accounted for 53.7% of fatalities. Sudden cardiac death (n=68/162, 42.0%), head trauma (n=32/162, 19.8%), and heat related injury (n=25/162, 15.4%) were the top three diagnosis of fatality. Only three cases (2%) reported of having trained medical personnel on-site at the time of incident. CONCLUSIONS: Sports-related fatality among Japanese student athletes was highest in male baseball players during practice due to sudden cardiac death. Almost no incidents had trained medical personnel on-site at the time of the catastrophic injuries during school organized athletics in Japan.

Figure 1. APGM Sports Specialization Comparison in NFL and MLS

Figure 2. %MI Sports Specialization Comparison in NFL and MLS

Conclusion:
Adolescent MS specialization contributes to a reduction in injury predisposition in NFL athletes but not in MLS athletes.

3840 Board #157 May 30 8:00 AM - 9:30 AM
Removal From Activity Following Sport-related Concussion In Sex-comparable Sports
Aaron J. Zynda, Kyle M. Petit, Morgan Anderson, Christopher P. Tomczyk, Tracey Covassin. Michigan State University, East Lansing, MI.
Email: zyndaaar@msu.edu
(No relevant relationships reported)

As sport-related concussion (SRC) awareness has increased, timely reporting and immediate removal from play have become a focal point of proper management. Delayed removal may result in additional injury and protracted recovery. Research has demonstrated that girls are more honest and likely to report their concussion symptoms compared to boys. However, it is unknown if these reporting behaviors correspond with immediate removal from play in girls compared to boys in sex-comparable sports. PURPOSE: To compare the incidence of high school athletes not removed from activity following SRC in sex-comparable sports in Michigan. METHODS: An epidemiological study of athletes diagnosed with SRC participating in Michigan High School Athletic Association-sponsored basketball, baseball/softball, and soccer from 2016-2019 was performed. All SRCs were recorded in a Head Injury Reporting System by certified athletic trainers, administrators, or coaches. Removal from activity indicated the athlete was removed from play at the time of an injury event. Lack of removal does not indicate mismanagement at the time of the event, but that the injury was not reported. Incidence was calculated by dividing SRCs not removed by total SRCs in each sport. Risk ratios were calculated by dividing the incidence of girls not removed by boys not removed in each sport. RESULTS: A total of 3696 (2425 female, 1271 male) SRCs were reported, with the most occurring in girls’ soccer (n = 1024). Overall, 442 girls and 182 boys were not removed from activity, resulting in incidences of 0.18 (95% CI, 0.17-0.20) and 0.14 (95% CI, 0.12-0.16), respectively. Across all sports, girls were 1.27 (95% CI, 1.09-1.49) times as likely to not be removed from activity compared to boys. Girls had 1.16 (95% CI, 0.91-1.50), 1.19 (95% CI, 0.85-1.70), and 1.47 (95% CI, 1.21-1.78) times the risk of not being removed from basketball, softball, and soccer, respectively, when compared to the equivalent boy sports. CONCLUSIONS: Girls were at greater risk of not being removed from activity compared to boys in sex-comparable sports. Although girls are more likely to report symptoms of SRC, there is still a gap in their removal from play, potentially due to a delayed onset or recognition of symptoms. Future research and initiatives should target reporting and removal in female sports.

3841 Board #158 May 30 8:00 AM - 9:30 AM
Domain-specific Physical Activity, Pain Interference, And Musky Pain After Activity
Christopher TV Swain1, Julie K. Bassett, Allison M. Hodg1, Shahid Mahmood2, Harindra Jayasekara1, Robert J. MacInnis1, Graham G. Giles3, Roger L. Milne1, Dallas R. English1, Brigid M. Lynch1. 1Cancer Council Victoria, Melbourne, Australia. 2The University of Melbourne, Melbourne, Australia.
(No relevant relationships reported)

PURPOSE: The context in which physical activity is performed may affect self-reported indicators of pain. Using the Melbourne Collaborative Cohort Study, we examined associations between occupation, household, transport, and leisure physical activity with pain interference and muscle pain after activity. METHODS: The analysis included 9,577 working and 12,281 non-working participants. Physical activity was assessed using the International Physical Activity Questionnaire-Long...
Impaired quality of life (QoL) has been reported in different clinical populations such as patients suffering from cancer (CA), multiple sclerosis (MS) or cardiovascular diseases. A growing body of evidence indicates that physical activity (PA) affects subjective QoL while there is a dose-response relationship between the volume of exercise and its health benefits. PURPOSE: The present study assessed and compared PA levels and QoL of different clinical populations and age-matched healthy adults. METHODS: One hundred and thirteen volunteers, i.e., 29 with CA under chemotherapy (age: 56.0 ± 10.4 yrs, BMI: 27.2 ± 5.4 kg/m²), 20 with MS (age: 53.3 ± 4.4 yrs, BMI: 25.9 ± 3.5 kg/m²), 14 with hypertension (HYP) (age: 55.0 ± 11.0 yrs, BMI: 31.0 ± 6.0 kg/m²) and 50 healthy controls (CON) (age: 51.3 ± 6.5 yrs, BMI: 25.3 ± 3.1 kg/m²), participated in the study. Levels of PA and QoL were self-estimated with the International Physical Activity Questionnaire and the SF-36 Health Survey questionnaire or the EORTC-QLQ30, respectively. RESULTS: The weekly energy expenditure was higher (p<0.01) in the CON group (2684.8 ± 2763.6 METs) compared with all clinical populations (CA: 2176.5 ± 2033.6 METs; MS: 1560.9 ± 760.2 METs; MS: 64.2 ± 67.6 METs). Moreover, the metabolic cost of vigorous intensity PA was low in CA (30.6 ± 114.9 METs), HYP (36.9 ± 92.1 METs) and MS (0 METs), in contrast with the controls (102.0 ± 1472.5 METs) (p<0.001). Differences were also revealed in walking energy expenditure between CON and MS group (1653.4 ± 1726.4 vs 1140.0 ± 163.1 METs; p<0.001). Physical functioning (PF) score was higher in CON (85.5 ± 15.1) compared with MS (51.3 ± 31.2; p<0.001) and CA (69.4 ± 22.0; p<0.05). Furthermore, QoL was assessed as poor in MS (29.5 ± 20.4) and moderate to high in CA (59.8 ± 17.5) CON (71.10 ± 18.7); HYP (71.4 ± 14.3) (p<0.001). CONCLUSIONS: Our findings revealed that clinical populations included in this study had a lower total weekly energy expenditure compared to healthy individuals, without engaging in high-intensity PA. In particular, MS patients exhibited the lowest rates of PA, PF and QoL, while CA and HYP group showed higher scores in of PA, PF and QoL, implying a potential relationship between PA and QoL. The specific nature of each disease may explain the differences observed among the clinical populations examined.
Migraine headaches is a common disabling disorder which affect daily activities and academic performance in college students. There is disagreement in published research whether exercise triggers or prevents migraine. PURPOSE: The purpose of this study was to identify the relationships of migraine, regular exercise, sleep and stress in college students. METHODS: An online survey was sent to 9,675 students at a mid-sized university. A total of 675 students responded to the survey, with 557 respondents (5.7%) completing the entire survey [age: 21.01±4.86 y.o., females: 80.9% (n=451); males: 19.1% (n=110); other: 0.9% (n=5)]. Prevalence of migraine headache, self-reported triggers, exercise habits and perception of exercise in relation to migraine, and relationship between sleep (PSQI), stress (PSS) and migraine impact (HIT-6) were examined via SAS and MS Excel. RESULTS: Prevalence of self-reported migraine headache in the past six months was 63.5% (n=354) while prevalence of migraine headache confirmed by a physician was 26.7% (n=149). The top three identified trigger factors were life stress (96.6%), academic stress (96.6%) and lack of sleep (94.6%). About 40% of migraineurs reported that they did not have migraine 24 hrs after exercise. Participants who exercised regularly were less likely to get migraines (~21% less likely). Interestingly, those with migraines exercised more than those who did not have migraines (38.4% versus 23.5%). A higher sleep quality was inversely associated with migraines (~21% less likely). A higher sleep quality was inversely associated with migraines (~21% less likely). A higher sleep quality was inversely associated with migraines (~21% less likely). CONCLUSION: Stress and lack of sleep are the most common self-reported migraine triggers in college students. Our study found that currently migraineurs do more regular exercise than those who did not report migraines. Quality of sleep is an important factor in migraine prevention. Regular exercise has the potential to prevent migraines but further studies need to be done to examine the exercise frequency, duration, intensity to determine long term outcomes.

In order to develop a model for a safe and effective return to sport after injuries, it is important to identify the risk factors associated with the occurrence of an injury. For the first time, we introduce the Tensiomyography (TMG) in the field of sport injuries (SI), a non-invasive and selective tool for the assessment of skeletal muscle contractile properties. As a recommendation from former experiences, a FC Barcelona documented a Muscle Injuries Clinical Guide 3.0 that explicitly emphasizes the use of TMG for the follow-up of muscular functional recovery and to help decide when the athlete can return to play. PURPOSE: To develop a thigh SI prediction model and explore factors of safe return to play. METHODS: The ongoing research project aims to monitor SI epidemiology in Slovenian premium soccer clubs. We monitored TMG of vastus lateralis and medialis, rectus femoris, biceps femoris and semitendinosus of both legs; body characteristics (body height, mass and fat), motor tasks (strength endurance in hamstrings; explosive lower-body strength, flexibility of lower body). RESULTS: Based on 11 thigh SI we were able to predict four (sensitivity 27%, specificity 99%). When predicting only 6 biceps femoris hamstring SI we could predict 4 (sensitivity 88%, specificity 100%). The predictive factors were derived only from TMG parameters. It appears that the worst-case scenario for the SI occurrence of biceps femoris is short TMG-derived contraction time, high biceps femoris tone and low lateral symmetry. Interestingly, there were no significant predictors from body characteristics and motor tasks. CONCLUSION: Twenty-seven percent of all thigh SI and 80% of hamstring SI could be predicted solely from simple-to-use and non-invasive TMG screening. It seems that short contraction time (previously linked to high proportion of type II muscle fibers) and high muscle tone are risk factor for hamstring injuries, especially where imbalances between both lateral sides were present. Supported by Slovenian Research Agency (research core funding no. L5-8245).

Wushu Kung-Fu is a worldwide practiced martial art commonly known as “Kung-Fu”. The International Wushu Federation (IWUF) host a world competition every 2 years with more of 1,500 participants from countries all over the world. Musculoskeletal injuries are common among elite and amateur athletes of any sport. Access to health care and might determine their proper treatment and return to sport. PURPOSE: To assess the injuries rate among Elite Wushu Kung-Fu Martial Artists and observe the relationship between access to health care and proper injury treatment. METHODS: One hundred and three athletes (n = 103; Males = 69, Females = 34) completed a survey prior before the 10th World Wushu Championships in China. Out of this sample, 94 were performance athlete (Taolu) and nine were professional fighter (Sandao). RESULTS: Out of the 103 responders, 49.5% reported Ankle injuries, 29.1% Lower Back, 18% reported an Anterior Cruciate Ligament (ACL) injury, 18.4% meniscus, 5.8% of combined ACL and meniscus, 16.5% Patella Tendinopathy, 14.6% leg adductors injuries, 7.8% Medial Collateral Ligament, and 6.8% Lateral Collateral Ligament injuries; from these injuries only 48.5% reported a serious injury (time to heal > 8 weeks). About 50.5% of these injuries were reported to happened during technical training, 47.6% during jumping maneuvers, 17.5% during the warm-up and strength training, and 11.7% during competition. In terms of medical insurance, 46% reported to have private medical insurance, 29% government insurance, and 25% no insurance at all. In addition, 46.4% reported to have access to a Physical Therapist, and only 53.6% reported a access to Physical Therapist. A chi-squared showed no association between those who have medical insurance (governmental or private), or no medical insurance, and those who have access to proper physical therapy (p > 0.05). CONCLUSIONS: The great majority of injuries were reported to happen during technical training sessions and jumping maneuvers. The most common injuries sites were the Ankles, Lower back muscles, ACL, and Meniscus. Coaches and athletes might want to look into strategies on how to lower the risk of injuries at these specific sites for Martial Artists.
of a lower-extremity injury resulting in time loss were significantly higher in female players compared to male players (ORadj=2.1, 95% CI=1.9-2.3; p<0.05). Male sex was a significant factor for lower extremity injury (p<0.05). On the other hand, older age was a protective factor for lower extremity injuries (ORadj=0.99, 95% CI=0.98-1.00; p=0.79). Injury severity (F(1,167) = 4.6, p = 0.036) and mechanism of injury (F(1,167) = 11.5, p = 0.001) were significant factors influencing injury severity.

**CONCLUSIONS:** The results indicate that female athletes are at a higher risk of injury compared to male athletes, particularly in lower extremity injuries. Older age is a significant protective factor for lower extremity injuries. Injury severity and mechanism of injury also significantly influence injury severity. Further studies are needed to explore the underlying reasons for these findings and to develop targeted interventions to reduce injury risk in female athletes.
Sport-related concussions (SRC) represent approximately 9% of high school athletic injuries. This high incidence has contributed to participation reduction, concussion legislation, and rule modifications. With these changes becoming more frequent, it is unknown if SRC trends are decreasing.

**Purpose:** To examine trends in contact sport participation and SRC clinical incidence in high school athletes during the 2015-16 to 2018-19 athletic seasons.

**Methods:** A total of 724,784 athletes (male = 436,459; female = 288,275) participated on 15 sponsored teams in the state of Michigan during the 2015-16 to 2018-19 athletic seasons. Sport participation and diagnosed SRCs were reported by athletic trainers, coaches, or administrative officials using the Michigan High School Athletic Association Head Injury Reporting System. Clinical incidence was calculated for each sport by dividing the number of SRCs by the number of participants and is expressed per 100 athletes (95% CI). Linear regression was used to examine annual trends in participation and SRC clinical incidence for each sport. *p* < 0.05.

**Results:** Football (144,708), boys’ basketball (85,288), and girls’ volleyball (76,950) had the highest sport participation. A total of 15,300 SRCs were reported yielding an overall clinical incidence of 2.11 (95% CI, 2.08-2.14) SRCs. Football (4.52 [95% CI, 4.41-4.62]), boys’ ice hockey (3.51 [95% CI, 3.20-3.82]), and 8-person football (3.35 [95% CI, 2.85-3.85]) had the highest SRC clinical incidence. Trends in overall sport participation significantly decreased over time (-0.193.0 athletes; *p* = 0.02). Only football yielded significant participation reductions (1.86 [-3.6 to -0.01]), while trends in 8-person football (18.2 athletes; *p* = 0.03) and boys’ lacrosse (151.2 athletes; *p* = 0.03) increased. No significant trends were identified for overall SRC incidence (*p* = 0.14). Only girls’ basketball had a significant reduction in SRC incidence (*p* = 0.04).

**Conclusions:** Contact sport participation, especially in football, may be decreasing due to concerns over athlete safety. With SRC incidence not declining, stakeholders should re-evaluate current initiatives to identify a more successful approach at reducing these injuries. Improving contact sport safety may then assist in increasing high school sport participation.

Abnormal skeletal muscle lipid metabolism is associated with insulin resistance in people with type 2 diabetes. Recent studies have indicated that high-intensity interval training (HIIT) lowers blood glucose and improves insulin resistance in individuals with type 2 diabetes. However, the physical mechanism is largely unknown.

**Purpose:** This study aimed to investigate whether HIIT improves insulin resistance in T2DM mice by regulating lipid metabolism in skeletal muscle.

**Methods:** Diabetic mice were randomly assigned to the diabetes group (T2DM, n=11) and the HIIT group (n=11), and age-matched wild type mice were assigned as the control group (CON, n=11). HIIT was performed on a motorized treadmill at 15° inclination 5 days/week for 8 weeks. The mice were trained with a starting speed of 10m/min, where after HIIT consisted of 10 bouts of 4 min high-intensity treadmill running, interspersed by 2 min complete rest. The pace during HIIT was increased gradually from 16 to 26 m/min over eight weeks. The fasting blood glucose, glucose tolerance was measured one week before the end of the experiment, and the gastrocnemius muscles of mice were collected 36h after the last exercise. The fat content of skeletal muscle was detected by Oil Red O staining. Protein expression of ACC, HMGCR, Cpt-1α, and CD36 was measured with Western blot.

**RESULTS:** This fasting blood glucose was decreased in the HIIT mice when compared to that in the T2DM mice (17.6±0.72 vs. 19.8±0.74 mmol/L, *p* = 0.01). Glucose tolerance and the area under the curve (325±126.4 vs. 3737±38. mmol/L·min, *p* = 0.01) were improved after HIIT treatment when compared to that in the T2DM mice. Skeletal muscle exhibited a substantial amount of lipid deposition in the T2DM
group, which was markedly alleviated in the HITT group (p<0.05). In the skeletal muscle, HITT treated mice showed significantly decreased protein expression related to lipogenesis, including reductions in ACC (0.39-fold, p<0.01) and HMGCAR (0.52-fold, p<0.01). Additionally, the protein expression level of Cpt-1a (1.6-fold, p<0.01) and CD36 (1.78-fold, p<0.01) was significantly enhanced by HITT.

CONCLUSION: HITT improves insulin resistance was, at least partly, through deduces lipogenesis and increases lipolysis in skeletal muscle in the T2DM mice.

The Nuclear Hormone Receptor 4A family of genes have been observed to play a role in proper metabolic function in various tissues, including skeletal muscle.

PURPOSE: To analyze the effect of the Nr4a3 gene on respiratory capacity of mitochondria in skeletal muscle of mice on a normal or high fat diet.

METHODS: Nr4a3-/- and WT mice were fed a normal chow (NC) or high fat diet (HF) for at least 20 weeks. After euthanasia, soleus muscle was harvested and wet weight was measured. Muscle fibers were teased apart and permeabilized with saponin in preparation for respirometry. Mitochondrial respiration was evaluated using an Oroboros Oxygraph Respirometer. Respiratory capacity comparisons were made with a two-way ANOVA and Tukey multiple comparison test.

RESULTS: Oxygen consumption is reported as pmol/(s*mg wet tissue) and statistics are represented as mean ± SEM. In the WT male mice there was a decrease in coupled complex I supported respiration in HF vs. NC diet (25.9 ± 7.3 vs. 64.5 ± 6.0, p = 0.004). In the HF WT group there was also a decrease in coupled complex I and II supported respiration (57.2 ± 13.4 vs. 102.5 ± 7.0, p = 0.0005) and uncoupled respiration (61.4 ± 15.0 vs. 107.8 ± 7.1, p = 0.0004) compared to NC WT. In female mice there was also a decrease between HF WT and NC WT in complex I (28.2 ± 3.7 vs. 57.4 ± 5.7, p = 0.0005) and complex I and II (78.2 ± 6.1 vs. 108.8 ± 6.7, p = 0.0003) supported respiration as well as in uncoupled respiration (87.1 ± 7.1 vs. 119.4 ± 8.9, p = 0.0001). However, there was no significant difference between the WT NC mice and either of the Nr4a3-/- groups. Coupled complex I, complex I and II and uncoupled respiration states in both Nr4a3-/- groups were not significantly different from WT.

CONCLUSIONS: The Nr4a3 gene plays a role in mitochondrial function in mouse skeletal muscle. Feeding mice a high fat diet impairs proper mitochondrial function in muscle when compared to a normal chow diet. The decrease in respiration from the HF diet is dependent upon the function of the Nr4a3 gene, as no decrease was observed in Nr4a3-/- mice. A limitation of this study is that this effect could be due to the lack of Nr4a3 in the skeletal muscle, or a secondary effect of lacking the gene in other parts of the body.

Insulin resistance (IR) increases the risk for Alzheimer’s disease and other dementia; however, the underpinning mechanisms for this increased risk remain to be fully defined. Improved mitochondrial function is one component contributing to cognitive impairment.

PURPOSE: As insulin resistance impairs mitochondrial oxidative metabolism and increases reactive oxygen species (ROS) in skeletal muscle, we considered whether similar events occur in the brain, which is the brain, which has low mitochondrial activity, rich in insulin receptors and mitochondria. Further, we sought to determine whether aerobic exercise (AE) could prevent the hypothesized deficits in mitochondrial function accompanying diet-induced IR.

METHODS: 12-week-old, male, C57BL/6 mice were fed a standard (Chow) or high fat diet (HFD) (60% kcal from fat) for four weeks and provided access to running wheels (EX) or sedentary (SED) conditions (n = 9-10 per group). Following treatment, mice were freshly isolated from the cerebrum to assess mitochondrial respiration, ROS production, and ATP production.

Insulin resistance was determined ex vivo in the hippocampus by the ability of insulin to stimulate AKT-phosphorylation. mtDNA copy number, mRNA expression, and proteomic measurements were performed on isolated hippocampal tissue. RESULTS: HFD induced hippocampal insulin resistance (p < 0.001), which was corrected by AE. HFD decreased ATP production 12% (p = 0.01) and increased ROS emission 79% (p < 0.01) in isolated cerebral mitochondria, which were rescued with AE. Impairments in mitochondrial function with HFD were parallelized by reductions in mtDNA copy number (1.00 ± 0.06 vs. 0.85 ± 0.06; p = 0.02) and mRNA expression of mitochondrial genes, such as PGC1α (1.00 ± 0.05 vs. 0.78 ± 0.07; p = 0.03) and TFAM (1.00 ± 0.08 vs. 0.62 ± 0.11; p = 0.03), which were corrected by AE. Proteomic analysis of the hippocampus showed that HFD led to oxidative post-translational modifications (PTMs) to 17 mitochondrial proteins (corrected p-value ≤ 0.05 and absolute log2 fold change ≥ 0.5); however, this increase in oxidative PTMs to mitochondrial proteins with HFD was almost completely reversed by AE. CONCLUSIONS: HFD induces IR in the cerebrum and hippocampus, which associates with mitochondrial dysfunction. Brain IR and mitochondrial dysfunction accompanying HFD are prevented with AE.
Gliarial cell-derived neurotrophic factor (GDNF) is an important indicator that represents the function of nervous system. Exercise and hypoxic environment both can reduce weight and improve nervous system function in obese rats. But the mechanism by which hypoxic training affects the nervous system is unclear.

**PURPOSE:** To determine the potential mechanisms of hypoxic training on GDNF in the cortex of obese rats. **METHODS:** Forty SD obese rats were assigned into one of the following groups (n=10 each): normal oxygen control group (NC), normal oxygen training group (NT), hypoxic control group (HT), and hypoxic training group (HT). Rats were kept continuous exercise 1 hour per day, 6 days per week for 4 weeks. After 4 weeks, the expressions of GDNF in the cortex were detected by quantitative fluorescent PCR and Western blotting. The level of inflammatory cytokine interleukin 1β (IL-1β) and interleukin 6 (IL-6) in the cortex were measured by ELISA. The phosphorylation of ERK1/2 and JNK of cortex were detected by quantitative fluorescent PCR and Western blotting. The level of phosphorylation of ERK1/2 and JNK of cortex were detected by quantitative fluorescent PCR and Western blotting.
Exercise contributes to both caloric expenditure and nutrient partitioning. We have shown that lean sedentary (LS) male mice had lower levels of insulin and Interulin-6 (IL-6) when compared to their high-fat fed sedentary (HFS) counterparts. Further, both exercise groups, lean (LX) and high-fat fed (HFX) demonstrated lower ghrelin, a hormone that regulates appetite and energy homeostasis levels compared to their sedentary counterparts. However, there is little work done in understanding the female response to blood biomarkers and exercise. PURPOSE: Therefore, the purpose of this study was to replicate our previous study in female mice to ascertain which biomarkers are similar across gender, and further evaluate any potential differences. We hypothesized that female mice would have a similar inflammatory biomarkers response as males, but a different hormonal profile. METHODS: Thirty-six, 6-week old C57BL/6NTac female mice were fed a normal or high-fat diet for 12-weeks and randomly assigned to exercise or sedentary groups. After 12 weeks animals were sacrificed, and blood was collected for metabolic hormone analysis using a magnetic bead-based multi-analyte panel. A total of seven biomarkers were analyzed including: insulin, peptide-YY (PYY), ghrelin, amylin, IL-6, tumor necrosis factor alpha (TNF-α), and pancreatic polypeptide (PP). RESULTS: HFS female mice had the highest body weight, kcal intake per day and percent weight increase compared to all other groups (p<0.05). Exercise attenuated the body weight gain in HF-fed mice (24.7g vs. 30.3g). Exercised groups had significant decreases in levels of insulin (1286.925 pg/ml, 2810.290 pg/ml; p<0.01) and amylin (67.233 pg/ml, 95.048 pg/ml; p<0.009), and increased levels of PYY (18.840 pg/ml, 61.688 pg/ml; p=0.031) compared to sedentary groups. Groups fed HF diets also had increased levels of PYY (64.673 pg/ml, 15.978 pg/ml; p=0.018) compared to normal diet groups. CONCLUSION: Exercise attenuates body weight gain and the rise in insulin in mice fed high fat diet and this is consistent between genders. Further, appetite/glucose regulating hormones like amylin and PYY are significantly altered in females but display different responses in males. This continues to add to the exciting story of metabolic differences between males and females.

**CONCLUSION**

Type 2 diabetes mellitus (T2DM) has become the most common metabolic disease in Western society, leading to significant health problems and financial burdens. Numerous researchers have investigated different therapeutics to target T2DM, but the underlying molecular mechanisms are still not completely understood. Our laboratory and others have demonstrated consistent downregulation of the microRNA-16 (miR-16) in skeletal muscle across human, rodent, and tissue culture models of T2DM.

**PURPOSE:** To investigate how deletion of miR-16 gene affects insulin sensitivity and exercise capacity in mice. **METHODS:** 10 wildtype (WT) and 12 muscle miR-16 knockout (KO) male mice were used for this study. At wk 9 of age, bodyweight, graded exercise test (GXT), glucose tolerance test (GTT; at 0, 10, 30, 60, 120 min) and insulin tolerance test (ITT; at 0, 15, 30, and 60 min) were measured. At 10 wks of age, half of the mice were given high-fat diet (HFD; 45% calories from fat) to induce insulin resistance, while the remainder were fed normal chow (~17% calories from fat). At 13 wk bodyweight, GXT, GTT, and ITT were repeated to examine the effect of HFD on miR-16 KO condition. Data were collected 36-hours after final exercise session (or rest). Respiration protocols included lipid (octanol-carminiculate) and non-lipid (glutamate/succinate) substrates. **RESULTS:** Among sedentary mice, WD had higher body weight and fat mass than LFD (P<0.0001), but only in males. WD had lower in-cage respiratory exchange ratio than LFD (P<0.05) regardless of sex, indicating greater whole-body reliance on lipids. In males, WD+Ex stimulated mitochondrial lipid respiration more so than WD alone (P<0.05). Females had no significant changes in mitochondrial lipid respiration. Non-lipid supported mitochondrial respiration was not significantly altered by WD or WD+Ex regardless of sex. **CONCLUSION:** In agreement with our hypothesis, WD stimulated lipid-specific mitochondrial respiration that further increased with Ex, but only in male mice. There were apparent sex differences such that females were protected against WD-induced weight gain alongside limited changes in mitochondrial lipid respiration.

**Non-lipid supported mitochondrial respiration was not significantly altered by WD or WD+Ex regardless of sex.**

**CONCLUSION:** In agreement with our hypothesis, WD stimulated lipid-specific mitochondrial respiration that further increased with Ex, but only in male mice. There were apparent sex differences such that females were protected against WD-induced weight gain alongside limited changes in mitochondrial lipid respiration.
**Purposes**: The aim was to explore the regulation mechanism of aerobic exercise on brown adipose tissue (BAT) in obese mice and the role of COX2.

**Methods**: The mice were randomly divided into the control group (C, normal diet), obesity group (H, high-fat diet to establish obesity model) and the obesity exercise group (HE, high-fat diet and medium intensity treadmill training). Blood lipid and obesity were measured. The Chow Base Study Group (EBR), that was more effective than HIIT in promoting FGF21 and KLB expression in liver (fgf21: 1.63±0.31 vs. 1.27±0.18), exercise+saline (ES) (n=8), liver (L), and blood glucose levels (C: 0.71±0.1, H: 10.22±1.77, HE: 8.25±1.33). The BP of up-regulated genes in group C were mainly enriched in immune system progression, inflammatory and immune response, down-regulated genes were lipid metabolism and reduction. The up-regulated genes in group H were enriched in glycolipid metabolism, while the down-regulated genes were cell death and apoptosis. VEGF signaling pathway plays an important role in this process, and COX2 in the VEGF pathway played a central role by interaction analysis. Application of Isopropranolol could increase the glycine level (12.81±3.8 vs. 31.27±3.49) and the protein expression of VEGFAs (1 vs. 1.34±0.12), COX2 (1 vs. 1.49±0.22) and UCPI (1 vs. 1.27±0.18); Simultaneous up-regulated genes in group HE/H were enriched in glycolipid metabolism, while up-regulated genes in group H/C were mainly enriched in immune system progression, inflammatory and immune response, down-regulated genes were lipid metabolism and reduction. The up-regulated genes in group H/C were enriched in glycolipid metabolism, while the down-regulated genes were cell death and apoptosis. VEGF signaling pathway plays an important role in this process, and COX2 in the VEGF pathway played a central role by interaction analysis. Application of Isopropranolol could increase the glycine level (12.81±3.8 vs. 31.27±3.49) and the protein expression of VEGFAs (1 vs. 1.34±0.12), COX2 (1 vs. 1.49±0.22) and UCPI (1 vs. 1.27±0.18); Simultaneous application of NS-398 could inhibit the protein expression of COX2 and UCP1 in brown adipocytes were detected.

**Results**: High-fat diet could induce obesity, accompanied by increased blood glucose and lipid levels (2.03±0.09 vs. 4.54±0.3), reducing UCPI1 levels (1 vs. 0.71±0.1) in BAT. Aerobic exercise could significantly reduce the obese mouse weight (C: 26.21±0.57; H: 27.53±0.61; HE: 26.32±0.52) and blood glucose levels (C: 0.71±0.1, H: 10.22±1.77, HE: 8.25±1.33). The BP of up-regulated genes in group H/C were mainly enriched in immune system progression, inflammatory and immune response, down-regulated genes were lipid metabolism and reduction. The up-regulated genes in group H/C were enriched in glycolipid metabolism, while the down-regulated genes were cell death and apoptosis. VEGF signaling pathway plays an important role in this process, and COX2 in the VEGF pathway played a central role by interaction analysis. Application of Isopropranolol could increase the glycine level (12.81±3.8 vs. 31.27±3.49) and the protein expression of VEGFAs (1 vs. 1.34±0.12), COX2 (1 vs. 1.49±0.22) and UCPI (1 vs. 1.27±0.18); Simultaneous application of NS-398 could inhibit the protein expression of COX2 and UCP1 in brown adipocytes were detected.

**Conclusions**: Obesity could lead to disorder of glycolipid metabolism and inflammation of BAT. Aerobic exercise could activate BAT activity through VEGF-COX2 pathway to reduce adverse effects of obesity. Funded by FRF for the Central Universities of China (2018GJO17).
Activation of AMPK-activated kinase (AMPK) in skeletal muscle increases FA oxidation by inducing Acetyl-CoA Carboxylase (ACC) deactivation. However, the upstream signal molecules that activate AMPK/ACC signaling remains unclear. It is expected that Fatty Acid Translocase (FAT/CD36) will become another potential target for diabetic therapy after AMPK.

PURPOSE: To explore the role of CD36, as a signal molecule, in regulating the upstream signaling pathway of AMPK/ACC in skeletal muscle under HFD conditions.

METHODS: First, siRNA interference was used to knock down CD36 gene in C2C12 cells to investigate the effect of CD36 deficiency on the phosphorylation of AMPK/ACC signaling in skeletal muscle cells. Then, male Sprague-Dawley rats (C57BL/6) were randomly divided into two groups: control group (C; n = 6), and high-fat diet group (HFD; n = 6). The expression levels of CD36 protein and phosphorylation of AMPK/ACC signaling under HFD conditions were detected by Western blotting method; the translocation of Liver kinase B1 (LKB1) in nucleus was detected by immunofluorescence method; the ultrastructural changes of skeletal muscle were detected by electron microscopy; and the activity of mitochondrial respiratory enzyme was detected by colorimetry.

RESULTS: CD36 deficiency activated AMPK (0.129 ± 0.009 vs. 0.417 ± 0.055, P < 0.05), ACC (0.044 ± 0.008 vs. 0.081 ± 0.010, P < 0.05) signaling in skeletal muscle cells. Compared with the C group, the expression levels of CD36 protein in HFD group were significantly increased (0.225± 0.041 vs. 0.506 ± 0.022, P < 0.01), the phosphorylation levels of AMPK (0.142 ± 0.020 vs. 0.079 ± 0.010, P < 0.05) and ACC (0.229 ± 0.023 vs. 0.191 ± 0.028, P < 0.05) were significantly decreased, and induced LKB1 translocation from cytoplasm to nucleus. In addition, electron microscopic results showed that HFD increases mitochondrial density, while normal rats had lower mitochondrial content. Although the expression levels of CD36 protein and phosphorylation of AMPK/ACC signaling under HFD conditions, thereby regulating FA oxidation under HFD condition.

Supported by the National Natural Science Foundation of China (No. 31600966).

**3874 Board #191 May 30 9:00 AM - 10:30 AM**

**Insulin Action And Body Composition In Aged C57bl/6 Mice: A New Model For Obesity**

Dakemhoy Hoyte, Katy Ehnhorst, Noa Mills, Thomas H. Reynolds. Skidmore College, Saratoga Springs, NY. (Sponsor: Donald R. Dengel, FACSJM) (No relevant relationships reported)

The prevalence of obesity in the United States has increased dramatically over the last three decades resulting in a major public health crisis. Feeding mice a high fat diet is a pervasively used model to study mechanisms of human obesity. However, the rapid weight gain that occurs in high fat fed mice and the extremely high fat content of commercially available experimental rodent diets pose serious limitations on the rapid weight gain that occurs in high fat fed mice and the extremely high fat content of commercially available experimental rodent diets pose serious limitations of this approach. A more appropriate model to study human obesity might be the aged male C57BL/6 mice. PURPOSE: To determine body composition and insulin action in young (YG, 6 months), aged (AG, 18 months), and very old (VO, 28 months) C57BL/6 mice. METHODS: Body composition was assessed by an LF50 Body Composition Analyzer (Bruker, Inc.). Insulin action was determined by conducting insulin tolerance (IT), glucose tolerance (GT), and 4-carboxamide ribonucleoside (AICAR) tolerance (AT) tests. Data was analyzed by using a 1 x 3 analysis of variance and least significant difference post-hoc test. Statistical significance was set at P < 0.05. RESULTS: Body mass (YG: 30.7±1.1 vs AG: 46.3±1.7 vs VO: 39.1±1.6 g) and fat mass (YG: 5.8±1.0 g vs AG: 21.6±1.6 g vs VO: 10.2±1.8 g) were significantly higher in AG mice compared to VO and YG mice. Lean mass was significantly higher in VO mice compared to AG and YG mice (VO: 20.4±4.4 g vs AG: 19.6±0.6 vs VO: 23±4.5 g). The area under the curve (AUC) for the GT test was significantly lower in VO mice compared to YG and AG mice (YG: 5930±3287 vs AG: 5843±3423 vs VO: 3337±2286). The AUC for the IT test curve was similar in YG, AG, and VO mice (YG: 11120±214 vs AG: 11804±343 vs VO: 11138±988). Although the AUC for the AT test was similar, the decline in glucose following AICAR injections was significantly less in VO mice compared to AG and YG mice, indicating an impairment in AMPK activity. These data suggest that adiposity increases substantially in 18 month old male C57BL/6 mice, a process that appears to be accelerated by 28 months. Further, age does not appear to cause a deterioration in insulin sensitivity when assessed by an IT test. The lower glucose values observed during the GT test in VO mice is likely due to enhanced insulin secretion. Overall our findings indicate that male C57BL/6 mice may be a valuable model to examine mechanisms of obesity when studied at approximately 18 months of age.
to C and T (50% higher), and HFD-T (40% higher) groups (P<0.05). HFD-T group presented higher levels of PPARα protein and gene compared to C (60%-higher), T (50%-higher) and HFD (50%-higher) groups (P<0.05). HIF-1α mRNA expression was reduced in HFD-T rats compared with HFD (P<0.05). Detraining caused increase on the weight gain (50% higher) and fat mass (44% higher) compared to HFD-T (P<0.05). HFD-D maintained protein expression of TNFα and PPARα elevated compared to HFD and reduced HIF-1α mRNA expression compared to HFD (P<0.05). CONCLUSION: Therefore, RTr can attenuate HIF-1α and TNFα gene expression, and prevent reduction of PPARα independent on the ingestion of a high-fat diet. Additionally, TNFα expression remained lower, and PPARα expression remained increased in detrained rats, even with increased fat mass. These results suggest that four-week detraining can accelerate the gain of fat mass, without eliciting an inflammatory response in the adipose tissue. Supported by CAPES – Finance code 001.

**3877 Board #194 May 30 9:00 AM - 10:30 AM**

**An Enzymatically Driven Hydrogen Peroxide Exposure To Human Hepatocytes And Its Effects On Iron Homeostatic Proteins**

Chandler Eyre, David Eastley. Brigham Young University, Provo, UT.

*(No relevant relationships reported)*

Previous data in our lab has shown that high concentration (200 µM) H2O2 exposure induces iron dysregulation in muscle cells. It is known that following strenuous exercise, oxidative stress is induced in tissues, leading to iron dysregulation, and generation of reactive oxygen species. Due to the unstable nature of H2O2 in solution and the critical role of the liver in iron homeostasis, we sought to see how human hepatocytes would respond to a 12-hour low-dose H2O2 exposure that mimics the concentration of neutrophils during the inflammatory response using glucose oxidase (GOX) and Catalase (CAT).

**PURPOSE**

To determine the effects of a low-concentration, H2O2 exposure on the iron regulatory proteins such as TFR, and Ferroportin Light-Chain (FLC) in HepG2 cells.

**METHODS**

When HepG2 cells reached 80% confluency, iron treatments of 10, 50, and 100 µM were prepared for 24 hours using FeCl3 solution diluted in media. Groups that received both iron and H2O2 treatments were exposed to 12 hours of iron, followed by 12-hour incubation with media that included both iron and a GOX-CAT cocktail. Western blots were carried out to measure protein content relative to controls. Cell viability was assessed using an MTT assay.

**RESULTS**

MTT assays for both FeCl3 and FeCl3 + H2O2 groups did not show any significant cell death. Treatment with FeCl3 alone resulted in a significant decrease in TIR for all three groups when compared against controls (C=1±0.1 SEM vs. 0.71±1; p=0.01; n=12). We observed a significant increase in FTL, but only in the 10 µM group (C=1±0.1 vs. 1.6±0.2; p<0.01; n=11). We saw no significant change in FTL at 50 and 100 µM. H2O2 treatments driven by GOX and CAT produced concentrations of 5-10 µM, mimicking neutrophils during inflammatory response. The addition of a low concentration H2O2 stress resulted in a 7-fold increase of FTL content at all iron exposure concentrations (C=1±0.3 vs 9.3±0.9 10 µM; p=0.01; n=4). Groups of 50 and 100 µM also showed similar results, with an increasing trend.

**CONCLUSION**

A low concentration exposure of H2O2 and iron to human hepatocytes results in a significant increase in FTL when compared to iron exposure alone. This suggests that liver cells have a robust defense against iron-dysregulation induced by oxidative stress. We are still evaluating changes that occur in other iron regulatory proteins.

**G-37 Free Communication/Poster - Energy Metabolism, Obesity, and Weight Control**

**Saturday, May 30, 2020, 8:00 AM - 10:30 AM**

**Room: CC-Exhibit Hall**

**3878 Board #195 May 30 9:00 AM - 10:30 AM**

**Circulating Klotho Response To A Behavioral Weight Loss Intervention In Adults With Overweight Or Obesity**

Katherine A. Collins1, Renee J. Rogers, FACSM2, Fabrisia Ambrosio1, Kelliann K. Davis, FACSM2, John M. Jakicic, FACSM2, 1Duke University, Durham, NC. 2University of Pittsburgh, Pittsburgh, PA. (Sponsor: John Jakicic, FACSM)

*(No relevant relationships reported)*

Klotho, a biomarker of aging, is associated with a slower aging process. Klotho concentration is lower among adults with obesity compared to normal-weight adults, and exercise may independently increase levels of Klotho. Whether Klotho is altered by weight loss and whether there is an added effect of exercise are not understood.

**Purpose:** This study examined changes in Klotho concentration in response to a behavioral weight loss intervention among adults with overweight or obesity.

**Methods:** A subset of 152 adults (age: 45.4±8.0 years; BMI: 32.1±3.7 kg/m²) who participated in a 12-month weight loss intervention were classified as an intervention “responder” (achieved ≥10% weight loss at both 6- and 12-months) or “non-responder” (achieved <5% weight loss at both 6- and 12 months). Intervention conditions included: 1 diet only (1200-1800 kcal/day), 2 diet plus 50 min/wk of moderate- to vigorous intensity physical activity (MVPA) per week, 3) diet plus 250 min/wk of unsupervised MVPA per week. Measures of height, weight, body composition, cardiorespiratory fitness, and Klotho were completed at baseline, 6-, and 12-months. Klotho was analyzed using solid-phase sandwich ELISA kits.

**Results:** There were significant (P<0.0001) changes in weight (-12.5±5.1 kg), percent body fat (-7.1±5.5%), lean body mass (-1.7±2.0 kg), and cardiorespiratory fitness (3.3±4.1 ml/kg/min) from baseline to 12-months. Klotho significantly (P<0.009) changed across the 12 months (baseline: 935±381 pg/ml; 6 months: 985±450 pg/ml; 12 months: 1040±423 pg/ml), with no difference by intervention group or weight loss response. Participants who performed physical activity had non-significantly greater changes in Klotho. Klotho was consistently associated with lean body mass at baseline (r=-0.19), 6 months (r=-0.23), and 12 months (r=-0.19) (P<0.05). Klotho was not predictive of change in weight, body composition, or fitness.

**Conclusion:** Klotho significantly, but modestly, increases with weight loss; however, the increase in Klotho was not sustained throughout the intervention. There may be an influence of physical activity on change in Klotho with weight loss, but this warrants further investigation. Further investigation to examine how weight loss and physical activity may alter biomarkers of aging in adults with obesity may be warranted.

**3879 Board #196 May 30 9:00 AM - 10:30 AM**

**Effects Of Beetroot Juice Components On Exercise Tolerance And Cardiometabolic Health In Individuals With Obesity**

Christian E. Behrens, Rakesh Patel, Ahmed Khandaker, Braxton Linder, Jose Fernandez, Brenda Bertrand, Gordon Fisher, FACSM. University of Alabama at Birmingham, Birmingham, AL. (Sponsor: Gordon Fisher, FACSM)

*(No relevant relationships reported)*

Routine exercise training is known to improve health outcomes in individuals with obesity (IO); however it remains challenging for IO to adhere to exercise programs. Thus, it is critical to identify novel strategies that can improve exercise performance (EE) and lead to greater adherence in IO. Beetroot juice (BJ), high in inorganic dietary nitrate, has been shown to consistently improve exercise performance in athletes, individuals with cardiopulmonary diseases, and non-obese lean individuals. These improvements may be explained by reduced oxygen uptake (VO2) during exercise, enhanced blood flow, and greater mitochondrial efficiency. To date, we are aware of no studies that have compared the effects of BJ, sodium nitrate (NaNO3), denitrified BJ (PLA), and control (CON) conditions for improving EE and cardiometabolic health in IO. **PURPOSE:** to determine if BJ improves EE, exercise efficiency (EE) and cardiometabolic health in IO and identify possible mechanisms of action.

**METHODS:** Vascular health (blood pressure and arterial elasticity), VO2 on a cycle ergometer during submaximal- and maximal- exercise, and time to exhaustion (TTE) were assessed in 16 sedentary IO in a crossover design for the following 4 conditions: 1) consumption of BJ, 2) NaNO3, 3) PLA, or 4) CON. Study visits were at least 72 hours apart. **RESULTS:** A significant treatment effect was observed for submaximal exercise VO2 (p=0.003), and TTE (seconds) (p=0.035). Post hoc analyses demonstrated a lower VO2 during submaximal exercise in BJ compared to PLA (p=0.009) NaNO3
Central adiposity, and particularly visceral fat, is tightly associated with metabolic health. Gold standard measures for visceral fat, MRI and CT, are impractical for widespread use. Ultrasound, DXA, and bioimpedance are useful alternatives, though their associations with metabolism are less understood.

OBJECTIVE: To test associations of abdominal adipose by ultrasound (US), DXA, and bioimpedance (BIA) with insulin sensitivity (IS), β-cell responsivity, physical activity, and adiponectin (AdipN), an adipokine tightly associated with visceral fat.

METHODS: After overnight fast, 41 normoglycemic young women (Age 20.9 ± 2.7; BMI 27.8 ± 3.5) completed DXA (GE Lunar) and BIA (InBody 770) for VAT and %BF; US for visceral (VAT-US) and subcutaneous adipose thicknesses (SAT-US) measured 1cm superior to umbilicus; circumferences; 2-hr OGTT (75g); and 5-day accelerometer (Steps; ActiGraph GT3x). Plasma insulin, c-peptide, and AdipN were determined by ELISA. IS was calculated using Matsuda Index from insulin and glucose at 0 and 120 min.

RESULTS: VAT-DXA correlated strongly with VAT-BIA (r = .95, p < .05 for all), but not SAT-US (r = -.02) or V AT-BIA (r = -.31, p < .05 for all), but not IS, VAT-US (r = .38, p < .05 for all), but not AdipN (r = -.31, p = .05). Over 12-months, RMR (p=0.88), TT3 (p=0.89), EA (p=0.85) and RMR ratio (Harris-Benedict: p=0.021; DXA: p=0.019; Cunningham1980: p=0.019; Cunningham1991: p=0.016) significantly predicted participants as energy replete; however, when using a more lenient clinical TT, threshold of ≥80% of TL, only the DXA ratio threshold yielded a significant model (p < .001). The relationship between RMR ratio and TT, remains constant over time with excellent reliability helping to validate the use of RMR ratio for the longitudinal characterization of energetic status in exercising women (i.e. prospective serial monitoring).

PURPOSE: To find out the characteristics of accurate fat distribution of healthy adolescent in China and compare the differences between different genders.

METHODS: We recruited 36 healthy adolescents, with no obesity or malnutrition. (12-17 years old, 3 men and 3 women of each age; height: 155.24±15.66 cm; mass: 48.60±14.41 kg). Scanning the whole body by MRI (1 cm apart). The visceral fat, subcutaneous fat and intramuscular fat of trunk, upper and lower limbs were calculated by gray area. The derivative index of the above indicators is obtained by dividing the area by the square of height. SPSS 22.0 was used to analyze the data with a t-test.

RESULTS: 1) Fat mass. The visceral fat, the intramuscular fat of trunk and the subcutaneous fat of upper and lower limbs were higher in women than in men. But there was no significant difference in fat quality between men and women (p<.05). 2) Fat mass index. There was a significant difference between the female and the male in the subcutaneous fat index of the upper extremity(en.0.531;0.44,0.63,0.16,p=0.048), and a significant difference between the female and the male in the subcutaneous fat index of the lower extremity(m:1.94±0.61;f:2.5±0.51;p=0.002). There was no gender difference in muscle mass between upper and lower limbs (P=0.05). The visceral fat index of female was higher than that of male (m:0.43±0.12;f:0.53±0.17;p= 0.042).

3) The total fat mass of male accounted for 38.89% of the total fat mass, which was lower than that of female(41.77%), but there was no significant difference (p<.05). The visceral fat mass of male accounted for 10.10% of the total fat mass, which was higher than that of female (9.11%). The upper limb fat mass of male accounted for 12.17% of the total fat mass, which was significantly higher than that of female(10.72% ) (p= 0.048). There was no significant difference between male and female in the subcutaneous fat index of trunk, upper and lower limbs (p>0.05).

CONCLUSIONS: There was no gender difference in fat mass of different parts of adolescent. The subcutaneous fat index and visceral fat index of women were higher than that of men, but there was no gender difference in muscle fat index. The centripetal accumulation of puberty fat male was not obvious, but the proportion of upper limb fat was relatively high.

3880 Board #197 May 30 9:00 AM - 10:30 AM Associations Among Measures Of Abdominal Fat And Metabolic Health In Normoglycemic Women

Katherine H. Ingram, Janeen Amason, Calah Coleman, Brian Kliszczewicz, FACSM. Kennesaw State University, Kennesaw, GA. (Sponsor: Brian Kliszczewicz, FACSM)

Email: khingram@kennesaw.edu

(No relevant relationships reported)

Resting metabolic rate (RMR) ratio has been shown to be an indicator of energetic status as indicated by significant correlations with total triiodothyronine (TT3) concentrations in exercised women. However, it is unknown whether the relationship between RMR ratio and TT, remains constant over time. PURPOSE: To examine the relationship between RMR ratio and TT, in exercising, ovulatory, weight-stable women for a 12-month observational period. METHODS: We performed a 12-month longitudinal analysis of data from exercising women (n=14). Dual-energy X-ray absorptiometry (DXA) and indirect calorimetry provided data on anthropometrics and energy expenditure. Harris-Benedict DXA, and Cunningham (1980 and 1991) equations estimated RMR and RMR ratio. Repeated-measures analysis assessed changes over time (ANOVA and Friedman). Intraclass correlation coefficient (ICC) and Cronbach’s Alpha measure agreement over 12-months for RMR ratio and energy availability (EA). A generalized linear model was tested to determine whether RMR ratio predicted TT, to be above or below two thresholds (TT<73.2ng/mL and TT>80ng/mL) over 12-months. RESULTS: Women had 25.9±5.4y, and at baseline, weighed 59.6±3.4kg with BMI 22.3±1.3kg/m², which remained unchanged during the study (weight: p=0.52; BMI: p=0.51). Over 12-months, RMR (p=0.88), TT (p=0.89), EA (p=0.21), and RMR ratio (Harris-Benedict: p=0.85; DXA: p=0.60; Cunningham1980: p=0.75; Cunningham1991: p=0.73) remained consistent for 12-months. Each RMR ratio remained constant over time with excellent reliability helping to validate the use of RMR ratio for the longitudinal characterization of energetic status in exercising women (i.e. prospective serial monitoring).

3882 Board #199 May 30 9:00 AM - 10:30 AM Sex Characteristics Of Fat Distribution In Chinese Adolescent: Based On Magnetic Resonance Imaging

Zhengyan Tang, Jingmin Liu, Xiao Hou, Yue Liu, Tonghua University, Beijing, China.

Email: tzy0565@sinia.com

(No relevant relationships reported)

As with any weight loss program, losing fat while maintaining muscle is a desirous outcome. We sought to determine how different types of habitual activity influenced the retention of muscle mass with a decrease in body fat.

PURPOSE: As a preliminary analysis to guide future research, the purpose of this study was to determine whether self-reported frequency of aerobic, strength, and stretching exercise (days per week) associates with body composition changes in response to weight loss in overweight and obese adolescents, with no obesity or malnutrition. PURPOSE: As a preliminary analysis to guide future research, the purpose of this study was to determine whether self-reported frequency of aerobic, strength, and stretching exercise (days per week) associates with body composition changes in response to weight loss in overweight and obese adolescents, with no obesity or malnutrition.

METHODS: Adolescents (n=23), 18-70 years old with a minimum waist circumference of 35 inches for women and 40 inches for men participated in an 8-week study diet intervention. Participants were asked to maintain habitual physical activity during the intervention. All participants reported their habitual exercise frequency for aerobic, strength, and stretching activities within a typical 7-day period. Body composition was assessed using bioelectrical impedance analysis (mBCA). After post testing, correlations (nonparametric, Spearman) between days reported for each activity and changes in body mass, percent body fat, visceral adipose tissue (VAT) and muscle mass were determined in participants who had a reduction in body mass during the intervention.

RESULTS: The

As with any weight loss program, losing fat while maintaining muscle is a desirous outcome. We sought to determine how different types of habitual activity influenced the retention of muscle mass with a decrease in body fat.

PURPOSE: As a preliminary analysis to guide future research, the purpose of this study was to determine whether self-reported frequency of aerobic, strength, and stretching exercise (days per week) associates with body composition changes in response to weight loss in overweight and obese adolescents, with no obesity or malnutrition. PURPOSE: As a preliminary analysis to guide future research, the purpose of this study was to determine whether self-reported frequency of aerobic, strength, and stretching exercise (days per week) associates with body composition changes in response to weight loss in overweight and obese adolescents, with no obesity or malnutrition.

METHODS: Adolescents (n=23), 18-70 years old with a minimum waist circumference of 35 inches for women and 40 inches for men participated in an 8-week study diet intervention. Participants were asked to maintain habitual physical activity during the intervention. All participants reported their habitual exercise frequency for aerobic, strength, and stretching activities within a typical 7-day period. Body composition was assessed using bioelectrical impedance analysis (mBCA). After post testing, correlations (nonparametric, Spearman) between days reported for each activity and changes in body mass, percent body fat, visceral adipose tissue (VAT) and muscle mass were determined in participants who had a reduction in body mass during the intervention.

RESULTS: The...
average number of days per week reported for each activity was 4.3 for aerobic, 1.8 for strength, and 3.3 for stretching. Change in body mass pre to post intervention was from 94.6 ± 22.3 kg to 92.9 ± 21.4 kg. The range in change for muscle mass was from -2.31 kg to +1.1 kg. There was a correlation (r = 0.603, p = 0.029) between days per week of aerobic activity and change in muscle mass. CONCLUSIONS: While all individuals of the analysis lost some weight during the intervention, some of them lost and some of them gained muscle mass. Individuals who reported more days of aerobic activity per week as their habitual activity level were more likely to retain muscle mass. Supported by the USA Dry Pea & Lentil Council

RESULTS: All participants had similar anthropometric measurements with a mean BMI of 30.6 kg/m². Male participants with low-grade inflammation phenotype oxidized a higher weight loss intervention. METHODS: Twelve overweight (94.0 kg ± 13.2), older adults (65.7 years ± 4.0) were enrolled in a 6-month weight loss intervention. Participants received a calorically reduced meal plan (500kcal/d) with 1.2g/kg protein to protect against muscle loss. Fourteen follow-up sessions were conducted. Body weight (BW) and skeletal muscle mass (SMM) were monitored utilizing InBody770. Post program interviews were audio-recorded, transcribed and analyzed using constant-comparative analysis. A 35-item weight loss strategy inventory was completed and analyzing utilizing descriptive statistics. RESULTS: Ninety-two percent (n = 11) of participants lost weight, with mean weight loss of 6.8% ± 4.4 of BW. Seventy-five percent of participants had weight loss of >5% of BW. Mean SMM loss was 0.099% ± 0.031 of BW with 33.3% (n = 4) of participants increasing or maintaining SMM. Participants used a mean 15 ± 6 weight loss strategies four or more times/week. Themes for successful weight loss included using personal behavioral strategies such as measuring portion sizes, biochemical and anthropometric motivators, personalized support, and accountability feedback and monitoring. Barriers included consuming the additional protein in the diet and care-taking of others.

CONCLUSION: Results of this study provide considerations for the development of strategies to achieve clinically significant weight loss (>5%) while maintaining SMM in older adults. The higher intake of protein to protect against muscle loss was reported to be difficult for participants. Both personal strategies, as well as external strategies provided through the counseling relationship, contributed to success.

Swimming is a favorable and ideal modality of exercise for individuals with obesity and arthritis as it encompasses a minimal weight-bearing stress and a reduced heat load. However, the available evidence indicates that regular swimming may not be effective in reducing body weight and body fatness. A current hypothesis is that exercise in cold water somehow stimulates appetite. PURPOSE: We determined the effect of swimming exercise training on fasting concentrations of ghrelin, insulin, leptin, and peptide YY in obese individuals with osteoarthritis. ghrelin, insulin, leptin, and peptide YY were included as a non-weight bearing land-based comparison group. METHODS: Thirty-nine obese participants with osteoarthritis (age = 59±1 years, BMI = 33±1 kg/m²) were randomly assigned to 12 weeks of supervised swimming training (N=19) or cycling training (N=20). In the initial few weeks, participants exercised for 20-30 minutes/day, 3 days/week, at an exercise intensity of 40-50% of heart rate reserve (HRR). Subsequently, the intensity and duration of exercise were progressively increased to 40-45 minutes/day, 3 days/week, at an intensity of 60-70% of HRR. Fasting blood samples were analyzed for ghrelin, insulin, leptin, and peptide YY concentrations.

Inflammatory markers are a well-known and reliable predictor of all-cause mortality in individuals as they are associated with disease-specific processes. It has also been established that individuals with higher adiposity tend to oxidize fat at a higher rate (10.2 ± 10.2% vs 30.7 ± 14.1%) of fat and greater Kcal of fat per kg body mass at 65% of VO2max. However, exercise intensities at 35%, 50%, and 80% of VO2max showed no difference between the two groups of males. Female participants showed no difference between inflammation phenotyping and utilization of fat during the graded exercise test.

CONCLUSIONS: It is understood that OW/OB individuals tend to oxidize a greater amount of fat than their lean counterparts, particularly during exercise. However, when observing OW/OB men who had been classified as having a low grade inflammation phenotype, were noted to utilize a greater amount of fat as exercise intensity increases.

using ELISAs. RESULTS: There were no group differences in body weight, BMI, or appetite stimulating hormones prior to the exercise interventions. Fasting plasma concentrations of ghrelin (37±8 vs. 42±11 pg/ml), insulin (1,176±424 vs. 1,179±442 pg/ml), leptin (20,200±2,891 vs. 16,617±2,734 pg/ml), and peptide YY (51±6 vs. 54±7 pg/ml) did not change with the swimming exercise intervention (all p > 0.05). Similarly, cycling exercise had no effect on ghrelin (36±10 vs. 44±8 pg/ml), insulin (978±321 vs. 964±311 pg/ml), leptin (29,261±5,438 vs. 26,308±8,771 pg/ml), or peptide YY (58±15 vs. 63±16 pg/ml) concentrations (all p > 0.05). CONCLUSIONS: This pilot study demonstrates that fasting levels of appetite stimulating hormones did not change with 12 weeks of swimming exercise intervention in obese participants with osteoarthritis and that there were no group differences in changes in these hormones between swimming and cycling exercise interventions.

**Rapid Weight Loss adversely Affects Muscle Damage Markers in Elite Judo Athletes**

Tatjana Trivić1, Nemanja Lakićević2, Roberto Roklicer1, Nebojsa Maksimović1, Ambra Gentile1, Antonino Bianco2, Sergej M. Istojčić3, Patrik Drjä1. 1Faculty of Sport and Physical Education, Novi Sad, Serbia. 2University of Palermo, Palermo, Italy. (No relevant relationships reported)

**PURPOSE:** To evaluate the effects of 7-day RWL intervention on muscle damage markers in seven elite judokas during a pre-competition period.

**METHODS:** The participants voluntarily participated in this study. RWL was induced in accordance to personal preference previously practiced by judo athletes. Most frequently reported methods of RWL were increased exercise volume, fluid and caloric restriction and heat exposure.

**RESULTS:** RWL induced a significant drop in weight within all seven participants (93.07 ± 10.69 kg at baseline vs. 88.12 ± 10.30 kg at follow-up; P < 0.001). Regarding biochemical changes, myoglobin levels significantly increased on the last day of intervention (P < 0.01) (day 7). In addition, creatine kinase levels were also elevated frequently reported methods of RWL were increased exercise volume, fluid and caloric restriction and heat exposure.

**CONCLUSIONS:** Based on the obtained results, RWL methods caused alterations in myoglobin and creatine kinase levels in elite judokas. This indicates that although RWL is perceived as helpful in achieving success in competition, it can produce muscle tissue damage that can further impact fitness profile of elite judokas. This project was partly supported by the Serbian Ministry of Education, Science and Technological Development (175037 and 179011), the Provincial Secretariat for Higher Education and Scientific Research (142-451-2477 and 114-451-710) and the Faculty of Sport and Physical Education, University of Novi Sad (2019 Annual Award).

**Whole-body Electromyostimulation Enhances Substrate Utilization of Fat and Carbohydrate in Men Compared to Women**

Marcos Roberto Queiroga1, Fernanda Civitella2, Edgar Ramos Vieira2. 1Federal University of Rio Grande do Norte, Natal, Brazil. 2University of Caxias do Sul, Brazil. (No relevant relationships reported)

**PURPOSE:** The goal of this study was to describe the baseline characteristics of older Hispanics with DM2 participating in a diet and exercise study in 3 senior centers. **METHODS:** Data from 38 older Hispanics with DM2 was collected. The variables included age, body mass, height, waist circumference, Hemoglobin A1C, glucose, blood pressure, chair stands in 30s, grip strength, balance, and preferred gait characteristics. **RESULTS:** The characteristics of the 38 participants (29 women, 9 men) that completed the baseline assessments to date were: age = 79±7 yrs (18 to 78 yrs; 80±7); body mass = 75±16 kg (73±13; 75±20); height = 157±10 cm (154±8; 160±9); body mass index = 31±6 kg/m² (30±7; 32±7); waist circumference = 101±11 cm (99±10; 101±12); A1C = 7±1% (7.1±1%; 7.3±1%); non-fasting blood glucose = 140±74 mg/dl (135±55; 157±30); systolic = 140±119 mmHg (139±18; 145±20) and diastolic blood pressure = 81±110 mmHg (83±10; 81±110). Their physical characteristics presented in Table 1 indicate frailty (e.g. chair stands ≤38, grip strength ≤22, 32 kg, and gait velocity ≤0.8m/s). **CONCLUSION:** The results indicate that at baseline the participants had high prevalence of obesity (abdominal and total), low levels of glycemic control, borderline high blood pressure, and have low levels of physical function that are indicative of frailty.

Supported by Werthem Innovation Faculty Grant from the NW Werthem College of Nursing and Health Sciences

**Table 1. Characteristic of the physical function baseline characteristics of older Hispanics with DM2**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Total (n=38)</th>
<th>Women (n=29)</th>
<th>Men (n=9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muscle strength</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chair test (rep)</td>
<td>8±4</td>
<td>8±4</td>
<td>8±5</td>
</tr>
<tr>
<td>Handgrip (kg)</td>
<td>21±6</td>
<td>19±5</td>
<td>29±5</td>
</tr>
<tr>
<td>A95 -EO (cm²)</td>
<td>5.1±3.3</td>
<td>5.2±3.4</td>
<td>5.0±3.0</td>
</tr>
<tr>
<td>A95 -EC (cm²)</td>
<td>7.9±5.8</td>
<td>7.9±6.0</td>
<td>7.5±5.3</td>
</tr>
<tr>
<td>VA-EO (cm/s)</td>
<td>3.9±0.8</td>
<td>3.8±0.7</td>
<td>4.0±1.1</td>
</tr>
<tr>
<td>VA-EC (cm/s)</td>
<td>4.9±2.1</td>
<td>4.6±1.3</td>
<td>5.7±3.5</td>
</tr>
<tr>
<td>Velocity (cm/s)</td>
<td>81±22</td>
<td>78±12</td>
<td>89±15</td>
</tr>
<tr>
<td>Gait (GaitRite®)</td>
<td>9±12</td>
<td>9±13</td>
<td>100±10</td>
</tr>
</tbody>
</table>

**Note:** A95: Area 95 - Eyes Open and Closed; VA: Velocity Average - Eyes Open and Closed; SL: Step Length (mean and right left); Data are presented as mean±SD

**Whole-body Electromyostimulation Enhances Substrate Utilization of Fat and Carbohydrate in Men Compared to Women**

Paula Angelo Rios1, Luciana Di Thomazono-Luporini1, Larissa Delgado André2, Audrey Borghi-Silva1. 1Federal University of São Carlos, São Carlos, Brazil. (No relevant relationships reported)

**PURPOSE:** To examine the difference in substrate utilization of fat and carbohydrate between men and women at different exercise intensities. **METHODS:** Participants (n=34) between 18-55 years old (Women: 35.9 ± 11.3 years; Men: 36.1 ± 7.7 years) with a BMI between 25-35 kg/m² (Women: 30.5 ± 1.7 kg/m²; Men: 30.6 ± 2.2 kg/m²) completed a modified Bruce protocol on a treadmill for measurement of a estimated VO2Max at their age-predicted heart rate max. To be included in the analysis these participants were required to reach 85% age predicted heart rate max. **RESULTS:** Women utilized a higher (p<0.05) percentage of fat at 65% (Women: 42.9 ± 16.9%; Men: 24.8 ± 17.7%; p=0.01) and 50% (Women: 27.7 ± 9.7%; Men: 18.2 ± 9.2%; p=0.01) of their VO2Max and greater (p<0.05) usage of overall Kcal from fat per kg of body mass at 80% (Women: 0.02 ± 0.02 kcal/kg; Men: 0.01 ± 0.01 kcal/kg) of VO2Max. Men relied more heavily (p<0.05) than women on carbohydrates per kg of body mass at 50% (Women: 0.03 ± 0.02 kcal/kg; Men: 0.06 ± 0.03 kcal/kg), 65% (Women: 0.07 ± 0.03 kcal/kg; Men: 0.13 ± 0.06 kcal/kg) and 80% (Women: 0.16 ± 0.08 kcal/kg; Men: 0.26 ± 0.08 kcal/kg) of VO2Max. **CONCLUSIONS:** Women oxidized more fat than men at 65% and 80% VO2Max, but not 35% and 50% VO2Max. As exercise intensity increased, the gap between women and men fat oxidation levels became larger. **Funding:** Montana State University Research Initiative 51040-MUSRI2015-03 and USDA-NIFA 2017-67018-26367.

**Whole-body Electromyostimulation Enhances Substrate Utilization of Fat and Carbohydrate in Men Compared to Women**

Bariatric surgery (BS) is the most effective treatment for morbid obesity. Early rehabilitation strategies may be able to improve functional capacity (6) and body composition that are impaired after the surgical procedure. In this sense, the whole-body electromyostimulation (WB-EMS) added to dynamic exercises may enhance the benefits for this population. **PURPOSE:** To evaluate if WB-EMS would enhance dynamic exercises on fat and leg fatigability, and body composition. **METHODS:** Randomized double-blind controlled clinical trial. Twenty-six obese women (37±7 years; BMI=37±4 kg/m²) were randomized after bariatric surgery into two groups (WB-EMS, n=13; ShamG, n=13). Before and after training protocol, the patients performed body composition analysis (Inbody 720) and the two minutes step test (CMST) for functional capacity evaluation with portable ergometer (Oxycon Mobile®), with Borg scale evaluation for effort perception. The WB-EMS (Miba)
Elevated Circulating Asprosin Impedes Low Intensity Exercise-induced Weight Loss in Obese Individuals

Uwe Schumann1, Shanshu Qiu2, Gunnar Treff2, Katrin Enders1, Nadine Rolser1, Jessica Schiele1, Lennart Mentz1, Kay Winkert1, Martina Zügel1, Lingjuan Jiang1, Jürgen M. Steinacker, FACS1, 1Ulmer University Medical Center, Ulm, Germany. 2Zhongda Hospital, Nanjing, China. (No relevant relationships reported)

PURPOSE: Circulating Asprosin is elevated in obese men and mice and mainly produced in white adipose tissue (WAT) to trigger hepatic glucose release into the bloodstream maintaining energy standards between meals, and hence has been suggested as pharmacological target to battle obesity and T2D. We hypothesized a mechanistic link to the empirical observation, why a predominant part of obese individuals mainly fail to lose depot-stored body fat despite their commitment to participate in aerobic exercise programs, and followed the research question if stress induced secretion of Asprosin during aerobic exercise counteracts the metabolic consumption of body fat through stimulating insulin triggered refueling of WAT.

METHODS: After overnight fasting 7 obese men and women (age 59.7±5.6; BMI 40.2±8.4) and 7 age and sex matched lean counterparts (age 59.5±5.2; BMI 22.9±1.5) performed a treadmill protocol for 25 min at 90% of an individual’s VT1 and RQ of ≤0.82 (controlled and adjusted if needed) to ensure that body fat as energy source was used. Venous blood samples (pre-, post-, 30 min post-, and 60 min post-exercise) were drawn to analyze Asprosin, Cortisol, Proinsulin, and acetylated Ghrelin using commercial ELISA kits.

RESULTS: Asprosin baseline data were significantly increased in obese compared to lean subjects (p<0.013) and further raised significantly during the course of the exercise trial only in obese. Stress marker Cortisol was comparable between groups at baseline (p=0.38) but significantly augmented in copulent participants only, while it significantly decreased in lean subjects during the exercise test. Proinsulin increased significantly from baseline to 30 min post-exercise in obese (p<0.013) but remained unaffected in normal weight subjects (p=0.99) while their baseline data were comparable (p=0.06). Hunger hormone Ghrelin was already significantly increased at baseline in obese vs. lean subjects (p<0.015) but raised even significantly further in obese at 30 min post-exercise vs. baseline.

CONCLUSIONS: The stress induced aberrant hormone reaction of obese individuals counteracts the metabolic consumption of body fat through stimulating the refueling of WAT. This observation helps to explain the difficulty of obese persons to lose excess body fat when performing low intensity exercise.
Purpose: Pediatric obesity has been linked to negative social outcomes in childhood. Minimal information is known about social outcomes in adulthood for obese pediatric patients and if they are linked with pediatric fitness. Methods: A retrospective chart review was performed evaluating all pediatric (<18 year old) youth with obesity who presented to the HealthWorks! pediatric weight management program from 1999-2009 and had a formal cardiopulmonary exercise testing (CPET), which was a requirement for clinic enrollment. Demographic and public record collection including body habitus, death records, real estate transactions and criminal conviction history was collected with baseline data compared to published lifetime criminal prevalence (Shannon SKS, et al, Demography 2017) and home ownership rates (US Census). Statistical analysis was performed using JMP®. Version 14 with differences between groups assessed using an unpaired t-test where a p-value <0.05 was considered significant. Results: A total of 719 pediatric youths with obesity (12.2±2.9 years) performed exercise testing with all patients now adults (28.5±3.7 years). There was a 1.5% mortality rate (11,719), and mortality was not associated with body habitus or any CPET parameter. Only 28.6% (206/719) of patients were able to complete a maximal effort CPET. On review of the criminal records, 9.7% (70/720) of these young adult patients were convicted of a felony compared to ~6% lifetime prevalence in Ohio during this period of time (p=0.004). There was no difference between incarceration rates of these now adult pediatric youths with obesity and the reported lifetime prevalence in Ohio (3.6% vs 3%, p=0.5). In addition, 14.7% (106/719) of study patients purchased a home in adulthood compared to 56.8% of Midwest adults <35 years of age (p=0.0001). Inability to complete a maximal effort CPET was associated with age, weight and future home ownership. History of criminal conviction was not associated with any study parameter. Conclusions: Children with obesity have higher social risk than their peers in adulthood as evidenced by higher rates of criminal activity and success in exercise training compared to their peers in adulthood. Participating patients with obesity have low rates of exercise test completion and pediatric exercise capacity is not associated with mortality or social outcomes.

Substantial exercise-induced weight loss is unachievable by many people. With no dietary modifications, a person of average size and fitness requires 60+ hours of moderate intensity exercise to lose 5 kg of fat. Individuals who are overweight or obese might not be able to contribute to cardiovascular and muscular fitness with successful exercise-induced weight loss, but it has yet to be determined if individuals with different patterns of weight gain (gradual vs fluctuation vs rapid) have different cardioregulatory and muscle health levels. PURPOSE: This pilot study’s aim was to determine if weight gain since the age of 20 and recent weight history is related to current cardioregulatory and muscular fitness. METHODS: A retrospective health and weight history questionnaire was completed and recent weight history is related to current cardiorespiratory and muscular fitness. RESULTS: Participants had an average body fat of 39.2 ± 5.4% having gained 9.3 ± 4.4 kg since the age of 20. Maximal oxygen consumption was 2.18 ± 0.5 L/min. No relationship existed between percentage of weight gain since 20 (25.96 ± 11.10%) and current maximal oxygen consumption (r = –0.08). CONCLUSIONS: Based on this pilot data it does not appear that fitness determines weight gain after age 20. Future studies will determine if type of weight progression over time (e.g. gradual vs fluctuation) and weight loss history are related to cardioregulatory and/or muscular fitness and if fitness can predict success in exercise-induced weight loss programs in overweight or obese individuals.

Background: In Kansas, 10% of adults have type one or type two diabetes (T1D, T2D). Although Federal physical activity (PA) guidelines including aerobic and strength training exercises are recommended for T2D; guidelines lack for T1Ds. A better understanding of differences in exercise behaviors amongst between populations is needed. Purpose: This study compared exercise behaviors of T1D, T2D, and non-diabetics (ND). Methods: Male (n=68) and female (n=267) participants ages 18-64 were recruited via social media (e.g. Facebook, Instagram) and newsletters and indicated consent prior to participation in the online survey. Data were collected for demographics, anthropometrics, diabetes status, and exercise (PA) behaviors. One-way ANOVAs, with Games-Howell post hoc tests were used to determine differences in aerobic activity and strength training between T1D, T2D, and ND participants. Results: Participants included 48 T1D, 24 T2D, and 240 NDs. Statistically significant differences existed for moderate aerobic PA between groups, f(2,304)=3.9, p=0.021, where T2D reported fewer weekly minutes (109.2±8.8) than ND (215.7±18.5, p=0.021). T1D (179.0±17.1) were not significantly different. No significant vigorous PA differences were found (p=0.242; T2D=66.3±80; T1D=17.6±50.5; ND=73±94.8 min/week). Strength training days/week differed between groups, f(2,234)=3.6, p=0.028 with T1D (1.8±2.0) reporting significantly more than T2D (0.7±1.0; p = 0.024); no significant differences for ND (1.5±1.7). Conclusion: Although statistically similar to T2D/ND, T1D’s mean moderate activity was over the recommended 150 min/week. T2D did report significantly more strength training days/week than T1D approaching recommended 2 days/week. Participants’ most popular PAs were walking (51%), and strength training (18%), thus Kansans should consider walking and strength training exercises.

Purpose: Montmorency tart cherry (MC) polyphenols possess vasomodulatory properties and their intake has been shown to reduce a number of cardiovascular risk factors. Despite this our understanding of the overall mechanisms of action and compounds that exert these benefits has yet to be fully elucidated. Purpose: The aim of this study was to characterise the effects of 4-week MC supplementation on vascular function in healthy adults and provide potential mechanistic evidence from urinary metabolite profiling. Methods: Twenty three healthy non-smoking individuals took part in a study in which they consumed either 30 mL of MC concentrate or an isocaloric placebo (PLA) bi-daily for 4 weeks. The study employed a randomised, double-blind, placebo-controlled, parallel design; mean ± SD age was 25 ± 4 years in the MC group (n = 12) and 22 ± 2 years in the PLA group (n = 11). Blood pressure, arterial stiffness (pulse wave velocity and digital volume pulse) were measured pre- and post-supplementation. Spot urine samples were also collected at the corresponding time points to determine the effect of the intervention on the urinary metabolite profiles. Results: There were no differences in blood pressure or arterial stiffness following the 4-week supplementation with MC compared to PLA. However, metabolite profiling highlighted changes to the urinary metabolome following MC consumption (P < 0.001 within and between groups). Several discriminatory metabolites of interest were putatively identified as metabolites of the tryptophan and histidine pathways. Conclusions: These findings suggest that bi-daily MC supplementation for 4-weeks has no influence on blood pressure or arterial stiffness in healthy individuals, but does exert distinct metabolic changes. Specifically, MC concentrate appears to influence amino acid metabolism which warrants further investigations.
Dietary Intake Is Associated With Ankle-brachial Index, Inflammation, And Ambulation In Peripheral Artery Disease Patients

Polly Montgomery¹, Ming Wang¹, Biyi Shen¹, Ana Canasegara, Fedrico Silva-Palacios¹, Allen Knechta, Andrew Gardner.¹
Penn State COM, Hummelstown, PA. ²Mayo Clinic, Rochester, MN. ³OUHSC, Oklahoma City, OK.

The aims of this study were (a) to determine whether the daily dietary intake of nutrients by patients(pts.) with peripheral artery disease (PAD) met recommended levels for adults 50 years or older, and (b) to determine whether meeting recommended levels of nutrients was associated with ankle-brachial index (ABI), inflammation, and ambulation of PAD pts.

Methods: 48 pts. were assessed on their dietary intake of 20 nutrients during a three-day period. Pts. were also characterized on demographic variables, comorbid conditions, cardiovascular risk factors, ABI, 6-minute walk distance, and high-sensitivity C-reactive protein (hsCRP).

RESULTS: Few pts. met the daily recommended intakes for calcium (4%), fiber (6%), vitamin E (6%), trans fatty acids (13%), vitamin A (15%), total sugars (19%), potassium (23%), sodium (29%), saturated fat (29%), and vitamin C (31%), and none of the pts. met the daily recommended intake of vitamin D (0%). Overall, pts. met few of the 20 dietary recommendations. Only 17 of 48 pts. met more than 7 of the recommendations. Only 17 of 48 pts. met more than 7 of the recommendations.

The ABI regression model adjusted for age, sex, race, smoking, hypertension, dyslipidemia, body mass index, and percentage body fat, total sugars was the only significant predictor (p<0.001) as pts. who did not meet the recommendation had lower ABI values. The hsCRP adjusted regression model, omega-3 polyunsaturated fatty acids (p<0.001) was the strongest significant predictor, indicating that those who did not meet the recommended level had higher hsCRP values. Finally, the 6-minute walk distance adjusted regression model, folate (p=0.011), and dietary score index (p=0.014) were significant predictors, as those who did not meet the recommendation for folate and those who met five or fewer of the 20 recommendations had shorter 6-minute walk distances.

CONCLUSIONS: PAD pts. consume a low nutrient dense diet that is deficient in omega-3 polyunsaturated fatty acids and folate, and contains too much added sugar, saturated and trans fats, and processed foods. Additionally, more severe PAD, greater inflammation, and ambulatory dysfunction are independently associated with aspects of a low nutrient dense diet, such as too much intake of added sugars, low intake of omega-3 polyunsaturated fatty acids and folate, and only meeting the recommended intakes of five or fewer nutrients.
Previous studies have demonstrated that perturbations in body weight result in modified resting metabolic rate (i.e., metabolic adaptation) that attempts to return the body to its customary weight (i.e., the set-point theory). How body weight changes during pregnancy impacts resting metabolic rate (RMR) and subsequently affects the ability to return to pre-pregnancy weight postpartum has not been investigated.

**PURPOSE:** To evaluate the effects of heavy rucksack loadings on physiological responses of Soldiers during incremental treadmill walking.

**METHODS:** Six male US Army Soldiers (age, 20 ± 1 years; height, 176 ± 6 cm; body mass [BM], 74 ± 5 kg) performed incremental treadmill walking while unloaded and carrying three proportional rucksack loads (22%, 44%, and 66% of BM). Treadmill speed was initially set at 4.2 km/h for 3 min then increased by 0.3 km/h every 2 min. Tests were terminated if volunteers completed the highest treadmill speed (7.1 km/h), reached volitional fatigue, or if their respiratory exchange ratio (RER) exceeded 1. Volunteers wore a chest strap heart rate monitor and breathed into a metabolic cart that measured oxygen consumption.

**RESULTS:** Volunteers completed all walking speeds while unloaded (7.1 km/h).

While speed did not decrease significantly when carrying 22% BM (6.9 ± 0.3 km/h; p = 0.09), volunteers finished at significantly slower speeds when carrying 44% BM (6.5 ± 0.6 km/h, p < 0.01) and 66% BM (6.0 ± 0.4 km/h, p < 0.01) relative to unloaded conditions. Peak oxygen consumption for the unloaded walk (1.85 ± 0.2 L·min⁻¹) was significantly lower than load carriage with 22% BM (1.97 ± 0.4 L·min⁻¹, p = 0.02) but not 44% BM (2.27 ± 0.5 L·min⁻¹, p = 0.09) or 66% BM (2.40 ± 0.6 L·min⁻¹, p = 0.06). Peak oxygen consumption for the unloaded walk (1.85 ± 0.2 L·min⁻¹) was significantly lower than when carrying 22% BM (2.25 ± 0.36 L·min⁻¹, p = 0.02) but not 44% BM (2.27 ± 0.55 L·min⁻¹, p = 0.09) or 66% BM (2.40 ± 0.65 L·min⁻¹, p = 0.06).

**CONCLUSION:** Heavy military rucksack loads severely impair marching pace and induce considerable cardiovascular and metabolic stress. Our results provide preliminary evidence that heart rate may be a superior work intensity indicator than oxygen consumption for Warfighter tasks.

The views expressed in this abstract are those of the authors and do not reflect the official policy of the Department of Army, Department of Defense, or the U.S. Government.
Caloric surplus has been associated with issues in body composition and weight management. In Mexico, 36% of women over 18 years of age reported performing some type of physical activity (PA). This troubling data are related to the overweight/obesity prevalence among female Mexican adults. Dance like, Zumba, and Twerk appears as an attractive form of PA for women. Howver, the effect they may have on energy expenditure and body composition remains unknown.

**Purpose**
To investigate energy expenditure and body composition in Mexican female recreational dancers of Latin, Zumba, and Twerk.

**Method**
77 women agreed to participate: Latin, 36, age 32.64 ± 13.16, BMI 24.41 ± 6.53, Zumba, 18, age 42.78 ± 16.55, BMI 26.63 ± 4.92, and Twerk, 23, age, 24.39 ± 5.38, BMI, 22.57 ± 1.45. Inclusion criteria included participation for more than 4 weeks and at least 2 sessions per week. Body fat percentage and fat-free mass were calculated using bio impedance (BIA). Total Kcal spent during the exercise was measured with a pedometer. The BMI was calculated using height and weight. The analysis consisted of ANOVA.

**Results**
Based on BMI standards, all (but the Zumba participants) were classified as normal. Body fat percentage: Latin 22.62 ± 7.64, Zumba 27.68 ± 7.86 and Twerk 23.59 ± 4.53 (p = 0.043). Fat-free mass: Latin 23.62 ± 7.65, Zumba 23.23 ± 3.92, and Twerk 28.63 ± 9.58 (p = 0.031). Total Kcal spent: Latin 62.84 ± 15.47, Zumba 67.22 ± 16.91, and Twerk 32.18 ± 7.90 (p = 0.000).

**Conclusion**
The overweight/obesity prevalence in Mexican women and its health implications have precipitated an increased awareness in the value of exercise prescription and adherence. These preliminary results show that Zumba generates greater energy expenditure. They also reveal that Zumba is more popular among older participants with higher BMI and fat percentage. Future studies should be longitudinal, investigate the effects of intensity of exercise and dietary habits on weight loss, and include participants of other weight classifications and dance fitness classes. Possible limitations include small sample size and unequal sample sizes.

**References**

**3909**

**Board #226**

**May 30 9:00 AM - 10:30 AM**

**Serum MOTS-c Concentrations Are Higher In Older Females Compared To Younger Males But Is Not Affected By Physical Activity Status Or Cardiorespiratory Fitness In Young And Older Adults**

**Andrew Wells**, Kurt Escobar, Anna Welch, Terence Moriarty, Kelly Johnson, Nathan Cole, Fabiano Amorim, Christine Merriam. University of New Mexico, Albuquerque, NM.

**Purpose:** To investigate the effects of intensity of exercise and dietary habits on weight loss, and include participants of other weight classifications and dance fitness classes. Possible limitations include small sample size and unequal sample sizes.

**Results**
Recent findings suggest that circulating MOTS-c concentrations are not affected by physical activity status, cardiorespiratory fitness, body composition, or normal HbA1c in healthy young and older adults, however, vary between sexes in older adults.

**Conclusion**
Recently, MOTS-c, a mitochondrial-derived peptide with effects on metabolic health, was identified. However, few data exist in humans including factors that affect circulating concentrations. PURPOSE: The aim of this study was to discern if serum MOTS-c concentrations were different between physically active and inactive young and older adults, or affected by cardiorespiratory fitness, body composition, hemoglobin A1c (HbA1c), and sex. METHODS: Forty-one healthy Young (18 – 30 yrs; n=26) and Older (55 – 70 yrs; n=15) adults participated in the study. Young and Older groups were further divided into Active and Inactive groups. Serum MOTS-c concentrations, maximum oxygen consumption (VO2max), body composition, and HbA1c were measured. Independent student’s t-tests were performed to determine group mean differences in serum MOTS-c concentrations between: Young and Older groups, Active and Inactive Young, Active and Inactive Older, males and females, Young male and older females, and Older males and females. An α-level of 0.05 was set as a priori. Pearson’s correlations were performed between MOTS-c concentrations and the following: VO2max, HbA1c, percent body fat, fat mass, and lean mass.

**Results**
There were no significant differences in serum MOTS-c concentrations between Young and Older subjects, between Active Young and Inactive Young or Active and Inactive Older subjects. Serum MOTS-c was also not correlated with VO2max, percent body fat, lean body mass, fat mass or HbA1c, which were in normal ranges. When sexes were analyzed separately, MOTS-c levels in Older females were significantly higher than Older males (419.9±43.3 vs 354.0±63.7 ng/mL, respectively; p<0.03). These findings suggest that circulating MOTS-c concentrations are not affected by physical activity status, cardiorespiratory fitness, body composition, or normal HbA1c in healthy young and older adults, however, vary between sexes in older adults.

**Background**
Diet of adult individuals with mid-spectrum Chronic Kidney Disease (CKD) remain understudied. The 2015-2020 Dietary Guidelines for Americans food patterns based on the Recommended Dietary Allowances (RDA) is in concert with the National Kidney Foundation Kidney Disease Outcomes Quality Initiative (NKF KDOQI) guidelines are advised to individuals with CKD. Estimated glomerular filtration rate (eGFR) remains the best method for tracking CKD progression, yet relationships between self-reported dietary intake and eGFR are understudied.

**Purpose:** To assess the self-reported dietary pattern in patients with stage 3 or 4 CKD in contrast to the RDA and NKF KDOQI dietary guidelines and to identify predictors of eGFR. METHODS: Twenty participants with stage 3 or 4 CKD (n = 6 male; M = 20.14 ± 5.9 years; BMI = 24.56 ± 3.7 kg/m²) completed self-reported dietary assessments for an average of 5 days. Diet was assessed using the ESHA Food Processor Software, Version 11.1. Micro- and macronutrient analyses for males and females were compared to the RDA and NKF KDOQI guidelines to identify malnutrition, and stepwise multiple linear regression models were used to identify predictors of eGFR. p-values were considered significant at the α = 0.05 level.

**Results:** On average, all subjects met the RDA and NKF KDOQI guidelines for caloric intake. Average consumption of saturated fat (F = 24.3 ± 10.8g, M = 34.1 ± 6.0g), sodium (F = 3780 ± 2150mg, M = 4210 ± 386mg) and protein (F = 65.0 ± 23.5g, M = 107.3 ± 27.3g) was high while the average consumption of fiber (F = 13.6 ± 4.1g, M = 14.8 ± 7.3g), calcium (F = 573 ± 325mg, M = 720 ± 224mg), potassium (F = 240 ± 1800mg, M = 940 ± 492mg) and phosphorous (F = 622 ± 1320mg, M = 425 ± 314mg) was low. Significant predictors of eGFR were age (β = -0.29, p = 0.023), calcium (β = 0.02, p < 0.001), body fat percentage (BF%) (β = -0.47, p = 0.001), communicable disease, and sex.

**Conclusion**
This study was supported by the Ball State University ASPIRE Graduate Student grant program.
3911 Board #228 May 30 9:00 AM - 10:30 AM

RELATIONSHIP BETWEEN INSULIN RESISTANCE, BODY COMPOSITION, AND PHYSICAL ACTIVITY IN OLDER ADULTS

Adam D. Mandrell, Callen R. Conroy, Alexandra I. Hopun, Kevin D. Ballard, FACSAM, Kyle Timmerman, FACSAM. Miami University, Oxford, OH. (Sponsor: Kyle L. Timmerman, FACSAM)

(No relevant relationships reported)

There are 27 million adults in the U.S. with type II diabetes mellitus, a condition associated with significant morbidity and mortality. Existing therapies can be costly, have side effects and may not achieve adequate disease control. Therefore, it is useful to identify lifestyle factors such as physical activity (PA) that may mitigate insulin resistance. Key clinical indicators of insulin resistance include fasting blood glucose (FBG), hemoglobin A1c (HbA1c) percentage, and the homeostatic model assessment of insulin resistance (HOMA-IR). PURPOSE: To evaluate the relationships among insulin resistance indicators, body composition, and objective and subjective measures of habitual physical activity in older adults. METHODS: In 82 generally healthy non-diabetic adults (≥58 years; 23.5 m/2) body composition (bioelectrical impedance), fasting blood glucose (glucometer), serum insulin (enzyme-linked immunosorbent assay), HbA1c (HbA1c Analyzer), objective PA (7-day accelerometry), and subjective PA (Community Healthy Activities Model for Seniors (CHAMPS)) were measured. Correlating for age and body fat percentage, partial correlations between insulin resistance indicators and biometrics were determined (Significance was set as α < 0.05). RESULTS: Mean values were (mean±sd): age (66.5±6.3 y), BMI (26.2±6.0 kg/m2), visceral fat (119.6±68.4 cm2), FBG (96.9±38.4 mg/dL), HOMA-IR (2.61±0.8), Hba1c (5.3±0.2%), and sedentary accelerometer (cts/min: 114.1±56.5; sedentary-to-total PA: 12.8±6.1%). FBG was significantly correlated with serum insulin (r = 0.26), visceral fat area (r = -0.40), cts/min (r = -0.29), and sedentary-to-moderate ratio (r = 0.24). HOMA-IR was significantly correlated with visceral fat (r = 0.41). No significant correlation was found between Hba1c and any measured variable. CONCLUSIONS: These preliminary data support previous findings that serum markers of insulin resistance are associated with physical activity and body composition. These findings suggest a potential role for using body composition and physical activity as clinical endpoints when managing patients with insulin resistance. Randomized controlled studies are needed to more rigorously assess the impact of physical activity on clinical indicators of diabetes mellitus in older adults.

3912 Board #229 May 30 9:00 AM - 10:30 AM

The Influence Of Heat On Appetite Regulating Hormones

Mark L. McGlynn1, Robert J. Schute2, Dustin R. Slivka, FACSAM.1University of Nebraska at Omaha, Omaha, NE. 2University of Virginia, Charlottesville, VA. (Sponsor: Dustin Slivka, FACSAM)

(No relevant relationships reported)

Leptin has been established as an energy-controlling hormone because of its role in activating the JAK-STAT pathway. Temperature has its own prominent role governing adipose derived appetite-regulating hormones (leptin and adiponectin) and the impact of environmental temperature (33 vs. 20°C) on adipose tissue hormone levels is not well established. PURPOSE: Determine the impact of environmental temperature (33 vs. 20°C) on adipose derived appetite-regulating hormones (leptin and adiponectin) and the impact on energy expenditure. METHODS: 10 college-aged males (27.3 ± 5.5, 86.7 ± 13 kg, and 1.83 ± 4.3 m; 58.9 ± 0.9 km2) completed two randomized, resting experimental trials in the Heat (HT, 33°C) and at Room Temperature (RT, 20°C) at 60% humidity. Blood draws were taken before intervention and after 3 hours for analysis of leptin and adiponectin. Oxygen consumption was measured at 1-, 2-, and 3-hour time-points. RESULTS: HT trial temperatures were greater than RT for both core (mean ± SEM; 37.17 ± 0.08 vs. 36.89 ± 0.08°C, p = 0.002) and skin (37.59 ± 0.10 vs. 32.65 ± 0.48°C, p < 0.001). Oxygen consumption in HT was greater than RT during the 2nd (4.37 ± 0.14 vs. 4.13 ± 0.15 ml/kg/min, p = 0.037) and 3rd hours (4.95 ± 0.26 vs. 4.28 ± 0.19 ml/kg/min, p = 0.002). Fasting leptin concentrations in HT decreased to a greater extent than RT (4.13 ± 0.15 ml/kg/min, p = 0.033), and daily caloric intake (β = 0.12, p = 0.001), weight (β = 0.42, p = 0.033), and daily caloric intake (β = 0.36, p = 0.045). CONCLUSION: When compared to the RDA and NKF KDOQI guidelines, CKD patients had poor nutritional quality. Increased protein intake and BF% were the strongest predictors of reduced eGFR. Future interventions in CKD patients should improve diet quality to concomitantly improve body composition and eGFR.

3913 Board #230 May 30 9:00 AM - 10:30 AM

Agricultural Activities Affect The State Of Body Characteristics In Peri-urban Kenya

Kenta Harai1, Tomonobu Sakurai2, Kenji Irie1, David Mungi1, Rose Okoye Opio1, Azumi Hida1, Madaka Kishino1, Hirotaka Matsuda1, 2Tokyo University of Agriculture, Tokyo, Japan. 1Twin University of Yokohama, Yokohama, Japan. 3University of Nairobi, Nairobi, Kenya. Email: k-hara@agrinutrihealth.com

(No relevant relationships reported)

PURPOSE: The research aims to find out the relationships between agriculture and health state in peri-urban Kenya. METHODS: We randomly selected 70 households who were former of vegetable and crop cultivation and mixed farming (vegetable and crop cultivation and husbandry) (male: 46 ± 10 yrs, n=35, female: 41 ± 9 yrs, n=35) in Wangige region (peri-urban setting), Republic of Kenya. Participants Data on body characteristics, daily activity by wearable devices, food consumption by the 24-hour recall, and well-being were collected by trained enumerators. In the research, there were positive correlation between weight (M = 72.1 kg, SD = 14.8) and intake of home garden foods in men (M = 37.2% SD = 16.5), r = 0.35, p = 0.05, n = 35. And weight (M = 74.2 kg, SD = 14.8) and time of over of activity level (2M = 88.1 min, SD = 95.3) in women, r = 0.34, p < 0.05, n = 37, And time of over of activity level (2M = 88.1 min, SD = 95.3) in number of agricultural fields (M = 1.3, SD = 0.6) in women, r = -0.55, p = <0.001, n = 37. There was negative correlation between weight (M = 74.2 kg, SD = 14.8) and intake of home garden foods (M = 37.8% SD = 13.1), r = -0.27, p < 0.05, n = 37, and Body Mass Index (BMI) (M = 28, SD = 5) and intake of home garden foods (M = 37.8% SD = 13.3), r = -0.38, p < 0.005, n = 37, in woman. CONCLUSIONS: In the Peri-Urban setting in the Republic of Kenya, the cause of increasing weight and BMI suggested that affect the decreasing intake of home garden foods and the number of agricultural fields in the female. Much of people works agriculture of main or side job in Kenya. Agricultural activity of role in peri-urban settings might affect daily activities and food consumption for the prevention of non-communicable diseases. The research was supported by academic cloud funding "Academist", Doctor support fund in Tokyo University of Agriculture, Global readership training program at United Nations University, Research Fund, Resilience at Works.

3914 Board #231 May 30 9:00 AM - 10:30 AM

Effects Of Acute Exercise On Appetite Regulation And Energy Intake In Men And Women

Selené Y. Tobin1, Marc-Antoine Cormier2, Mollie H. White2, Alison K. Hild2, Jonathan R. Miller2, Edward L. Melanson2, Tanya M. Halliday3, 1University of Utah, Salt Lake City, UT. 2University of Colorado - Anschutz Medical Campus, Aurora, CO. 3University of Colorado - Anschutz Medical Campus, Aurora, CO.

Email: selene.tobin@utah.edu

(No relevant relationships reported)

PURPOSE: Compare energy intake and appetite regulation responses between men and women following acute bouts of aerobic (AEx) and resistance exercise (REx). METHODS: Men and women (n=12 each) with overweight obesity matched on age (32.3±2 vs. 36.8±2 yrs, p=0.14) and BMI (28.1±1.2 vs. 29.0±1.5 kg/m², p=0.64) completed 2 conditions; 1) AEx (65-70% of age-predicted maximum heart rate for 35 minutes post breakfast). Appetite (visual analog scale for hunger, satiety and prospective food consumption [PF/P]) and hormones (ghrelin, PYY, and GLP-1) were measured before and every 30 minutes for 3 hours following consumption of a standardized breakfast. Post exercise ad libitum energy intake at the lunch meal was also measured. RESULTS: There was no difference in relative ad libitum energy intake between men and women following either AEx (43.4±5 vs.45.4±5% of total energy needs, p=0.80) or REx (48.3±1 vs. 46.6±3% of total energy needs, p=0.81). In the AEx condition there were no differences in area under the curve (AUC) for satiety or PF/C between men and women, although men reported higher PF/C vs women at the 30 (33.3±5 vs. 17.5±4 min, respectively, p<0.005) and 90 min (49.8±6 vs 30.2±6 min, respectively, p<0.005) post-prandial time points. Additionally, in the AEx condition a greater hunger AUC was detected in men vs women (7815±638 vs 5428±762 mm, respectively, p=0.02), which was driven by men reporting significantly greater hunger vs women at the 90 min post-prandial time point (42.7±5 vs.16.6±4 mm, p<0.001). No differences

Abstracts were prepared by the authors and printed as submitted.
The metabolic syndrome (MetS) is a worldwide public health concern and is characterized by having three or more of these risk factors: high blood glucose (GlC), increased waist circumference (WC), high blood pressure (BP), reduced serum high-density lipoprotein (HDL) and increased serum triglycerides (TG). As certain rural regions lack the required infrastructure for optimal medical care, mobile diagnostics units are being proposed, which could help by identifying people at risk for MetS.

**PURPOSE:** To test the reliability and validity of MetS risk factor analysis using point-of-care analyzers in a mobile examination unit.

**METHODS:** Fifty participants (18 test-retest; 52±7 y; 170±10 cm; 80±19 kg) were enrolled in the study. Agreement of GlC, HDL and TG of three point-of-care analyzers (A, B, C) against a reference lab (REF) were analyzed by Bland-Altman (bias, Limits of Agreement (LoA) McNemar’s test (MN)). Further, MetS diagnosis by the mobile setup was tested for inter-session reliability by Spearman’s ρ and test-retest variability (TVR%).

**RESULTS:** The range of systematic bias was for GlC -21 to -8 mg/dl, for TG -90 to 3 mg/dl and for HDL -8 to 9 mg/dl. Device C was excluded from further analyses due to missing values. Device A was chosen for additional analysis based on smallest bias and LoA (GlC: -8 [LoA -27 to 11] mg/dl; TG: 3 [LoA -40 to 46] mg/dl; HDL: -3 [LoA -16 to 11] mg/dl) and best agreement of MetS diagnosis with REF (MN: A vs. REF: p=0.05; B vs. REF: p=0.05). Test-retest analysis for risk factor classification and MetS diagnosis was performed in a mobile examination unit using device A. No inter-session differences for risk factor and MetS diagnosis were shown (MN day 1 vs. 2: p=0.05). Spearman’s ρ and TVR for risk factors were: TG: r = .734 (p=0.05); 3.3%; HDL: r = .893 (p=0.05); 6.8%; GlC: r = .076; 1.9%; systolic BP: r = .372; 1.7%; diastolic BP: r = .457; 3.3% and WC: r = .950 (p<0.05). 11%.

**CONCLUSIONS:** The mobile setup showed no inter-session difference in MetS diagnosis. TVR was low for all risk factors and test-retest reliability was acceptable for TG, good for HDL and excellent for WC. Inter-session variations in GlC and BP did not influence the overall risk factor classification and MetS diagnosis. A mobile setup using a point-of-care analyzer for blood analysis is a valid and reliable method for a near-to-home MetS screening.

**Board #232 May 30 9:00 AM - 10:30 AM**

**Reliability And Validity Of A Mobile Setup For Metabolic Syndrome Diagnosis Using Point-of-care Analyzers**

Sanne Paulien Huttenbou1, Anne Schraplau1, Michael A. Rapp1, Pia-Maria Wippert1, Heinz Völler2, Klaus Bonaventura3, Frank Mayer4. 1Universität Potsdam, Potsdam, Germany. 2Ernst von Bergmann Clinic, Potsdam, Germany. (No relevant relationships reported)

**Board #233 May 30 9:00 AM - 10:30 AM**

**Abstract Withdrawn**

**Board #234 May 30 9:00 AM - 10:30 AM**

**Nutritional Group Counseling Or Individualized Prescription? Anthropometric, Metabolic, Nutritional And Mental Health Responses: A Longitudinal Study**

Braulio H.M. Branco1, Marciele A. Bolognese1, Carina B. Franco1, Ariane A. Ferrai1, Nelson Nardo-Júnior1, Sônia M.G. Bertolíni2. 1University Center of Maringa (UNICESUMAR), Maringá, Brazil. 2State University of Maringa, Maringa, Brazil. Email: braulio@live.com (No relevant relationships reported)

**PURPOSE:** The aim of this study was to investigate short- and long-term compensatory effects on dietary intake following high intensity interval training (HIIT) compared with usual care moderate intensity continuous training (MICT) during and following a cardiac rehabilitation (CR) program.

**METHODS:** Ninety-three participants (72% men, 44% with coronary artery disease enrolled in a 4-week CR program and were randomised to 1) 4x4-minute HIIT; or 2) 40-minutes of MICT (usual care). Patients were instructed to complete 3 weekly sessions (2 supervised, 1 home-based) for 4-weeks, and 3 weekly home-based sessions thereafter for 48-weeks. Only CR group-based dietary advice was provided. Dietary intake was measured by a computer-based 24-hour recall over two days at baseline, 4-weeks, 3-months, 6-months, and 12-months. The Three-Factor Eating Questionnaire was used to measure dietary behavioral, and fasting appetite was assessed by a 100mm visual analogue scale. Appetite hormones (ghrelin, PYY, leptin) were also analysed at baseline and 3-months. Data are mean change (95% confidence interval).

**RESULTS:** There was no change over the study period or differences between HIIT and MICT for daily energy intake at 4-weeks (-0.1[-0.8,0.5] vs -0.4[-1.0,0.2] MJ; p=0.549) or 12-months [0.4[-0.6,1.3] vs 0.1[-0.9, 1.0] MJ; p=0.848]. There were also no group differences for macronutrients, saturated fat, or fibre. Over 4-weeks, an increase in dietary intake for both HIIT and MICT [7[-1,15] vs 6[-2,16]; time effect: p=0.028], coincided with an increase in hunger [6[1,10] vs 5[1,10]]; time effect: p=0.028).

**CONCLUSIONS:** Different nutritional interventions combined with concurrent exercise were effective in promoting improvements in anthropometrics, body composition, food intake and some mental health parameters. Therefore, the choice of the method of nutritional intervention should be based on the preference of the participants.

**Board #235 May 30 9:00 AM - 10:30 AM**

**Effects Of Nutritive And Nonnutritive Sweeteners And Exercise On Blood, Lipid, And Glucose Profiles**

Jarrett Walbolt, Yusnuk Koh. Baylor University, Waco, TX. (No relevant relationships reported)

Nonnutritive sweeteners are widely used as low-calorie replacements for nutritive sweeteners. Despite widespread use, it is unclear how nonnutritive sweeteners, when combined with exercise, influence plasma lipids and glucose.

**PURPOSE:** To investigate the effects of nutritive and nonnutritive sweeteners on plasma lipid profiles, complete blood counts, and glucose content following exercise.

**METHODS:** Ten healthy, college aged, individuals (4 females and 6 males) participated in the randomized, double-blinded, cross-over design study. Participants consumed 8 oz of sweetened drink, equivalent to three sodas worth of sweeter, containing either 445mg of stevia, 16mg of aspartame, 16mg of sucralose, or 110,000mg of sucrose in four separate occasions. After 30 minutes of each sweetened drink, participants completed a single bout of aerobic exercise at 70% of HRmax for 45 minutes. Overnight fasting blood samples were collected at baseline, 30-min-post-consumption of sweetened drink, and immediately post-exercise.

**RESULTS:** Sucrose resulted in significantly higher glucose content (115.8 ± 6.14 mg/dL) than either sucralose (87.2 ± 7.09 mg/dL, p=0.032) or stevia (86.1 ± 5.79 mg/dL, p=0.010) at the 30-min-post-consumption of the sweetened drink; however, this difference was no longer significant immediately post-exercise. Total cholesterol (TC), triglyceride (TG), and HDL-C were elevated following exercise (TC: 152.7 ± 9.66 to 158.6 ± 9.26 mg/dL, p=0.001; TG: 69.5 ± 5.78 to 76.8 ± 5.83 mg/dL, p=0.002; and HDL-C: 51.5 ± 2.47 to 53.9 ± 2.40 mg/dL, p=0.001, respectively). Neutrophils increased (55.7 ± 2.67 to 59.1 ± 1.93%, p=0.012) and lymphocytes decreased (36.8 ± 2.56 to 31.3 ± 1.56%, p=0.016) from baseline to thirty minutes post-consumption.

**CONCLUSIONS:** The nonnutritive sweeteners did not change glucose content from baseline through exercise. However, a nutritive sweetener resulted in a spike in glucose 30-min post-consumption, which returned to baseline levels immediately after exercise, suggesting that glucose may be used as a substrate during exercise. Elevated neutrophils, paired with decreased lymphocytes, may be indicative of an acute immune response to exercise.
G-38 Free Communication/Poster - Fat Metabolism
Saturday, May 30, 2020, 8:00 AM - 10:30 AM
Room: CC-Exhibit Hall

3921 Board #238 May 30 9:00 AM - 10:30 AM
The Effects Of One-week Exogenous Ketone Consumption On Short Distance Time Trial Running Performance
Kalin A. Tomlinson1, Samantha C. Silva1, Lee E. Brown, FACSM2, John P. Arreglado1, Edward Jo1. ‘California State Polytechnic University, Pomona, Pomona, CA. ’California State Polytechnic University, Fullerton, Fullerton, CA. (Sponsor: Lee Brown, FACSM)
Email: katomlinson@cpp.edu
(No relevant relationships reported)

Currently, there is equivocal knowledge concerning the effects of ketone salt supplementation on short distance running time trial (TT) performance in well-trained subjects. PURPOSE: To determine the effects of one-week exogenous ketone salt supplementation on 800m running TT performance during non-fatigued and pre-exhaustive states in endurance-trained subjects. METHODS: In a randomized, double-blind, placebo-controlled study, endurance-trained male and female participants were allocated to one of the following treatment groups for 8 days following an initial familiarization visit: Ketone supplementation (KET) (n=16) or placebo control (CON) (n=16). Subjects underwent two consecutive 800m TT before and after the 8-day treatment period on a self-propelled, non-motorized treadmill. Time-to-completion of the first (TT1) and second (TT2) TTs, the average time-to-completion across both TTs, and blood lactate response during the TTs were measured pre- and post-treatment. A mixed factorial ANOVA was used for data analysis. RESULTS: KET alone exhibited a significant increase in blood β-hydroxybutyrate from pre-post-treatment (p<0.05). A group x time interaction was only detected for TT2 performance (p=0.05) but not TT1. There was no pre- to post-treatment change in TT1 performance in either group. CON demonstration no change in TT2 performance from pre- to post-treatment; however, KET improved TT2 performance as reflected by a 3.7% faster time-to-completion from pre- to post-treatment (p<0.05). When examining the average time-to-completion across both TTs, there was a significant group x time interaction (p=0.04). CON showed no change while KET demonstrated a faster average time-to-completion from pre- to post-treatment (p<0.05). Blood lactate response to TTs decreased (p<0.05) in KET but not CON. CONCLUSIONS: In endurance-trained subjects, ketone salt supplementation does not appear to affect short-distance running TT performance in a non-fatigued state reflective of competition scenarios. However, ergogenic effects may be observed in high-intensity exercise when some level of exhaustion or energy substrate depletion is experienced prior, such as during training or prolonged, intermittently high-intensity sporting bouts.

3922 Board #239 May 30 9:00 AM - 10:30 AM
Effect Of L-carnitine And Exercise On Fat-rich Dietmice PPARα And LPL In Liver
Yue Fu. Shanghai University of Sport, Shanghai, China.
(No relevant relationships reported)

Effect Of L-carnitine And Exercise On Fat-rich Dietmice PPARα And LPL In Liver

Abstract:Objective: To investigate the effects of L-carnitine and exercise on lipid metabolism in the liver. Methods: To establish fat-rich diet model by feeding high-fat diets to mice. Fat-rich diet mice were divided into 4 random groups, the high-fat control group (HC group), the high-fat L-carnitine group (HL group), the high-fat exercise group (HE group) and the high-fat exercise combined with L-carnitine group (HEL group). Six weeks later, PPARα, LPL, FFA, TG, TC in liver and TG, TC in blood serum were tested. Results: Compared with control group, TG, TC in blood serum and TG, TC, FFA in liver was significantly low in the HE and HEL groups at the same time, LPL and PPARα were increased significantly in the HE and HEL groups. Compared with HE group, TC in blood serum and FFA in liver was decreased in HEL group, PPARα significantly up-regulated in HEL group. Conclusion: 1) Long-term aerobic exercise up-regulated expression of PPARα and LPL in liver, promoted FFA oxidative utilization. 2) In addition to PPARα, regulation of L-carnitine supplement to LPL may be affected by other factors. 3) L-carnitine can increase the expression of PPARα and decrease the content of FFA on athletic mice, to play its role in adjusting lipids.

Key words: L-carnitine; exercise; lipid metabolism
Extra-virgin olive oil (EVOO), commonly seen in Mediterranean diet, has been shown to exert anti-inflammatory effect in chronic disease prevention. Long-term high-fat diet increases chronic inflammation, which leads to cardiovascular diseases and metabolic syndrome. PURPOSE: The purpose of the study is to evaluate the effects of 12-week EVOO supplementation and exercise training on circulatory inflammatory markers in rats fed a high-fat diet. METHODS: Female Sprague-Dawley rats (age 4 weeks, n=36) were randomly divided into 3 groups. One group was fed a basal diet (C, N=12) with added cholesterol (1.25%) and cholic acid (0.5%) for 12 weeks. While on the basal diet, two groups were supplemented with 20% EVOO, half group being trained (T, N=12) on treadmill for 12 wks (25m/min, 10% grade for 60 min/day, 5 days/wk), and the other half being sedentary (S, N=12). Plasma inflammatory cytokines were measured by Multiplex immunoassays on Lumine 200. Data were analyzed using two-way ANOVA. RESULTS: EVOO supplementation elevated 1.91-fold on macrophage colony stimulating factor (M-CSF) vs. C (P<0.05), but this effect was decreased 3.34-fold by T (P<0.05). A significant increase in granulocyte-macrophage colony stimulating factor (GM-CSF) was found in EVOO vs. C (5.9-fold, P<0.05). Monocyte chemotactic protein-1 (MCP-1) level in plasma was decreased 1.46-fold in EVOO/T vs. C (P<0.05). Plasma interleukin-1β (IL-1β) and tumor necrosis factor-alpha (TNF-α) levels did not change in EVOO (P>0.05), but TNF-α was decreased 1.46-fold in EVOO/T vs. C (P<0.007). CONCLUSION: Dietary supplementation of EVOO resulted in an augmentation of plasma inflammatory cytokines levels in the sedentary rats fed a high-fat atherogenic diet, but these adverse effects were significantly reversed by chronic exercise training.

 Reduced fat oxidation is emerging as a predictor for obesity-related diseases; therefore, interventions that increase fat oxidation may have clinically important health benefits. Previous research suggests that exercise priming may provide a novel solution by augmenting fat oxidation during subsequent exercise. PURPOSE: To investigate the effects of morning Reduced-Exertion High-Intensity Interval Training (REHIT) on fat oxidation during afternoon Low-intensity Steady State (LISS) walking. METHODS: Twelve sedentary or recreationally active university students (7 male, 5 female) participated in 2 randomly assigned morning interventions, REHIT (two 20-second sprints on a cycle ergometer separated by 4-minutes of active recovery) or rest, on two separate days. On both occasions, participants returned to the lab in the afternoon (4 hours later) to complete a 45-minute treadmill walk at 5.6 km/h. Participants remained fasted for both morning and afternoon trials. Blood and gas samples were collected pre-, during, and post-LISS exercise. RESULTS: After 45 minutes of LISS walking, plasma non-esterified fatty acids (NEFA) were greater in the REHIT trial compared to control (REHIT, 7.13±3.53 µmol/L; CONTROL, 0.75±0.43 µmol/L, p<0.03; Cohen’s d = 0.67). Furthermore, plasma glucose, carbohydrate oxidation, respiratory exchange ratio (RER) and energy expenditure remained consistent between the trials across all time points (p = 0.40; p = 0.98; p = 0.92; p = 0.81, respectively). CONCLUSION: Exercise priming may not influence fat oxidation during subsequent exercise but may enhance carbohydrate metabolism, however, plasma NEFA may be greater suggesting changes in substrate availability. Relatively long rest intervals between the morning and afternoon trials and insufficient exercise workload could explain similarities in substrate oxidation. Isotopic research is required to understand the metabolic fate of the elevated substrate concentrations.
Background: The white adipose browning can improve fat burning and accelerate fat consumption. Irisin which is cleaved by FIBROnectin Type III Domain-Containing protein 5(FND5C) derived from muscle can act on white adipose tissue to promote the expression of Uncoupling Protein 1(UCP1). However, it is unclear which exercise models are better to contribute to produce Irisin. 

Purpose: To discuss whether High-Intensity Intermittent Exercise (HIIT) is better than Moderate-Intensity Continuous Exercise (MICIT) on the effect of improving white fat production of UCP1 and the mechanism of molecular biology. 

Methods: Thirty-two 4-week-old C57BL/6J mice were fed with high-fat diet(D12429) for 8 weeks and randomly divided into three groups: control group (GC, n=8), MICIT group (GM, n=8), and HIIT group (GH, n=8). Then, GM got an 8-weeks MICIT training (10min warm-up, 45min 60%VO2max speed, 6 times/week) and GH got an 8-weeks HIIT training (10min warm-up, 1set=1min 90%VO2max speed +2min60%VO2max speed, 12sets). 24 hours after the last training, anesthetization was dissected. Muscle tissue contented PGC-1αmRNA, FND5CmRNA, and Irisin. It was also taken by blood index. Irisin and UCP1mRNA were measured byubcutaneous white adipose tissue. The data were compared by using one-way analysis of variance. 

Results and Discussions: (1) Muscle: Comparing with GC, GM and GH both have a higher expression of PGC-1α mRNA but there is no significant difference, yet FND5CmRNA of GM is more than that (GC(7.53±5.36 vs. 1.00±1.13, p<0.05) and GH(3.17±1.05 vs. 1.00±1.13, p=0.01), Irisin of GM(32.22±2.88 vs. 25.99±4.50 pg/mg, p<0.05) and GH(32.10±3.44 vs. 25.99±4.50 pg/mg, p<0.05) are more than GC. 

(2) Serum: The Irisin level of GH is very significantly higher than GM (55.41±1.19 vs. 51.83±2.47 pg/ml, p<0.01). (3) Subcutaneous white adipose tissue: In respect of Irisin, GH is more than GM (37.68±3.55 vs. 29.77±2.89 pg/ml, p<0.01). UCP1mRNA, GH is more than GM (16.67±6.65 vs. 0.69±0.42, p=0.01). 

Conclusion: (1) Exercise can promote the production of Irisin upstream regulated factor, PGC-1α and FND5C. (2) HIIT compared with MICIT has a greater effect on improving the white adipose tissue browning through the molecular pathway of PGC-1α-FND5C - Irisin - UCP1.

Metabolic flexibility (MF) is the ability of the body to alter its reliance on fat or carbohydrate for energy purposes in response to a stimulus. The inverse, metabolic inflexibility, has been associated with type II diabetes and obesity. Given the prevalence of these disorders, assessing and improving MF is important. However, MF during exercise, particularly with respect to fat metabolism, in children remains poorly understood. 

**METHODS:** This study examined MF with respect to fat metabolism during exercise in lean (n=11; 10.9±0.9 years) and overweight/obese (OW/OB; n=8; 10.4±1.2 years) children. It was hypothesized that MF with respect to fat metabolism during exercise would be impaired in the OW/OB group as indicated by reduced use of fat as an energy source. 

**RESULTS:** Participants were grouped based on BMI percentiles for age and sex (Lean <$85$th percentile, OW/ OB <$85$th percentile). On the experimental visit, participants completed two 20-minute exercise bouts separated by a 10-minute rest. Bout 1 consisted of 10 minutes at 50% VO2max and 10 minutes at 75% VO2max. Bout 2 consisted of 20 minutes at 50% VO2max. Absolute fat oxidation rate (FOR; [mg·min⁻¹]), FOR relative to body mass [mg·kg⁻¹·min⁻¹], FOR relative to fat-free mass [mg·kgFFM⁻¹·min⁻¹], and proportional fat use (%Fat) were measured at 10 minutes of Bout 1 and at 5, 10, and 15, and 20 minutes of Bout 2. 

**RESULTS:** There was a main effect for time for %Fat and for each expression of FOR, with fat oxidation valuing only changing when compared to the second bout and were used to assess MF in children. Absolute FOR was higher in the OW/ OB group: range 121.6±57.6 to 213.7±45.7 mg·min⁻¹) than in the Lean group (81.1±32.5 to 152.2±38.2 mg·min⁻¹), however there were no main effects for group or interactions for %Fat (OW/ OB: 29.0±14.4 to 51.1±8.5; Lean: 25.9±10.9 to 41.8±6.5), FOR relative to body mass (OW/ OB: 2.41±1.3 to 4.10±0.7 mg·kg⁻¹·min⁻¹; Lean: 2.5±1.1 to 4.5±1.0 mg·kg⁻¹·min⁻¹), or FOR relative to FFM (OW/ OB: 4.15±1.97 to 7.12±1.17 mg·kgFFM⁻¹·min⁻¹; Lean: 3.49±1.54 to 6.29±1.13 mg·kgFFM⁻¹·min⁻¹).
Fruits high in anthocyanins, such as wild blueberries (WBs), have been documented to decrease oxidative stress in active and sedentary populations and has more recently demonstrated the ability to influence lipolytic enzymes and increase the rate of fatty acid oxidation (FA-ox) during rest. To date, changes in FA-ox during exercise has only been examined with blackcurrants. PURPOSE: To examine the effect of freeze dried WBs on the rate of FA-ox and lipid peroxidation during moderate intensity exercise.

METHODS: 11 healthy, aerobically trained males (26.6 ± 7.9 yrs, 74.7 ± 8.2 kg, 10.2 ± 3.4% BF) completed an incremental cycle test to determine VO2peak (54.7 ± 9.1 ml/kg/min) followed by a 2-wk washout avoiding foods high in anthocyanins. Participants completed a control (C) exercise protocol of cycling at 65% of VO2peak for 40 min. Urinary F2-isoprostanes (~ 50 mL) and capillary blood FA, glycerol, creatinine and free/tot al carnotine (~25 μL) were collected pre and post sessions. Ventilation, RER, lactate, HR, power output, RPM and RPE were collected before and at 10 min increments. Next, participants consumed 12.5 g freeze dried WB powder, 2x/day (25 g total) for 2-wks, then repeated the exercise protocol. Repeated measures ANOV As were used to determine differences between conditions. RESULTS: WBs reduced lactate at 20 (C: 3.0 ± 1.1 mmol vs WB: 2.6 ± 1.0 mmol; p<0.005), 30 (C: 2.9 ± 1.0 mmol vs WB: 2.2 ± 0.9 mmol; p<0.005) and 40 min (C: 2.5 mmol ± 0.9 vs WB: 1.9 ± 0.8 mmol; p=0.013) and carbohydrate oxidation by 10.1% at 20 (C: 2.17 ± 0.46 g/ min vs WB: 1.95 ± 0.42 g/min; p=0.024), 19.2% at 30 (C: 2.24 ± 0.52 g/min vs WB: 1.82 ± 0.48 g/min; p=0.014) and 14.8% at 40 g/min vs WB: 1.79 ± 0.45 g/min; p=0.045) while resulting in higher FA-ox by 19.7% at 20 (C: 0.45 ± 0.16 g/min vs WB: 0.53 ± 0.13 g/min; p=0.049), 43.2% at 30 (C: 0.41 ± 0.14 g/min vs WB: 0.58 ± 0.15 g/min; p=0.010) and 31.1% at 40 min (C: 0.45 ± 0.17 g/min vs WB: 0.59 ± 0.13 g/min; p=0.012). No differences were found between C and WB trials for all other variables. CONCLUSION: Results indicate that WBs may increase the rate of FA-ox during moderate intensity activity in active, healthy males. Potential complications with blood sample preparation may have led to unreliable results. Further, the exercise intensity may have been too low to see significant changes in urinary F2-isoprostanes.

**3932**

**Exercise Training Adaptations In Metabolic Syndrome Individuals On Chronic Statin Treatment**

Felix Morales-Palomino, Miguel Ramirez-Jimenez, Juan F Ortega, Alfonso Moreno-Caballés, Laura Alvarez-Jimenez, Ricardo Mora-Rodriguez, UCLM, Toledo, Spain.

Email: felixmoraemail@gmail.com

(NO relevant relationships reported)

Statins reduce atherogenic dyslipidemia and cardiovascular disease (CVD) risk in metabolic syndrome individuals (MetS). Exercise-training could also contribute to reduce CVD by improving cardiorespiratory fitness (i.e., VO2peak) and fat oxidation. However, some reports sustain that statin use could interfere with training adaptations. PURPOSE: To determine the therapeutic impact of an exercise-training program on fat metabolism and cardiorespiratory fitness in a group of MetS individuals chronically medicated with statins compared in a well-matched control group statin-naïve.

METHODS: One hundred and six MetS were divided into statin users (STATIN group; n=58) and statin-naïve. The control group was chronically medicated with statins in comparison to a well-matched control group (CON). The intervention lasted for 4 weeks. All comparisons were made using two-way ANOVA analysis. RESULTS: Training improved MetS components similarly in both groups (MetS Z-score -0.26±0.38 vs -0.22±0.31; P=0.001 for time and P=0.60 for time x group). Before training, STATIN had reduced muscle HAD activity and whole body FOXK compared to CONTROL (P=0.038 and P=0.002 for group, respectively). However, 16-weeks of HIIT increased HAD and FOXK in both groups (32% and 20% in STATIN and 3% and 10% in CONTROL, both P=0.03 for time and P=0.05 for time x group, respectively). VO2peak improved less in STATIN than in CONTROL group (12% vs 19%; P=0.013 for time x group). Conversely STATIN did not prevent the increases in CS with HIIT (38%; P=0.001 for time, P=0.199 for time x group). CONCLUSIONS: Our findings suggest that chronic statin use in MetS does not interfere with exercise training improvements in fat oxidation and neither with the muscle enzyme mediators of these responses (i.e., CS and HAD). However, STATIN attenuated the improvements in VO2peak with training. ClinicalTrials.gov identifier: NCT03019796
Hypoxic training combined with magnesium supplementation may promote liver lipolysis and fatty acid beta oxidation by activating liver PPARα and its downstream factors, improve liver lipid metabolism in obese mice.

**3935 Board #252**
**May 30 9:00 AM - 10:30 AM**
**Does Varying The Fatty Acid Composition Of A High-fat Meal Modify Postprandial Lipemia?**
Breanna L. Davidson, Stephanie P. Kuri, Jeremy D. Akers, Elizabeth S. Edwards, FACSM. James Madison University, Harrisonburg, VA. (No relevant relationships reported)

**PURPOSE:** The western diet is typically high in saturated fats (SF) or omega-6 polyunsaturated fatty acids (O6) with insufficient amounts of omega-3 polyunsaturated fatty acids (O3). When chronic, this diet has been associated with an increased risk of cardiovascular, metabolic, and respiratory diseases. The purpose of this study was to examine the effect of varying the fatty acid composition of an acute High-Fat Meal (HFM) on postprandial lipemia.

**METHODS:** Fifteen individuals [6 M, 9 F; body mass index (BMI) = 23.5 ± 6.6 kg/m2] consumed three HFM smoothies separated by a minimum of 48 hours. The three smoothies were high in SF [63% total fat, -0.02% from O3 and O6], O6 [15:0 to O6], and O3 [15:1 to O3] to O6. All were standardized to 12 kcal/kg body weight, 63% total fat, and 0.72 g/kg sugar. Blood triglycerides (TG) were collected at baseline, 2 h and 4 h postprandially.

**RESULTS:** There was a significant main effect of time for SF HFM and O3 HFM in TG from baseline to 4 h (P = 0.001 and 0.006), and a quadratic effect in TG from baseline to 4 hours in O6 HFM, where TG increased from baseline to 2 h and returned near baseline values at 4 h (P = 0.001). There was an interaction effect between condition and time effect for TG (P = 0.05) and no difference between O3 and O6 TG concentrations at any time point (P = 0.05). The TG concentrations were significantly lower from 2 h to 4 h postprandially in the high O6 (P = 0.005) and high O3 HIFMs (P = 0.033) compared to the SF HFM, which was increased from 2 to 4 h.

**CONCLUSIONS:** O6 and O3 HIFMs led to a more accelerated peak in postprandial TG and trended towards baseline by 4 h. The SF HFM resulted in a sustained elevation in TG with significantly higher concentrations at 4 h than at baseline. These findings suggest that varying types of fatty acids can lead to markedly different metabolic responses and that diets high in SF could have prolonged exposure to high blood triglycerides, increasing the risk of atherosclerosis and other chronic diseases.

**3937 Board #254**
**May 30 9:00 AM - 10:30 AM**
**Cyclooxygenase 2 Regulates Isoprenaline Induced Adipolysis In Brown Adipocytes**
Rongxin ZHU1, Lijing GONG2, Guang CAI1. 1Shanghai Research Institute of Sports Science, Shanghai, China. 2Beijing Sport University, Beijing, China. (No relevant relationships reported)

**PURPOSE:** By converting fat into heat, brown adipocytes (BAC) play an energy expenditure in mammalian. Cyclooxygenase 2 (COX2) is a key factor of Uncoupling protein 1 (UCP1) with which is essential for dissipating energy into heat via adipolysis. Isoprenaline (ISO) can induce adipolysis in brown adipocytes (BAC); however, whether COX2 takes part in ISO induced adipolysis remains unclear.

**METHODS:** C12H10T1/2; [cells were differentiated into brown adipocytes. BACs were treated with 10µM ISO or 10µM ISO and 100µM NS-398 (COX2 inhibitor) for 0 (as control), 1, 3, 6, 12 or 24 h. For lipid droplet (LP) size analysis, cells were fixed and stained with Oil Red O. Images were captured with a Leica CTR 4000 microscope with 10x objectives. All images were thresholded for LPs signal and watershed for individual LP size analysis. Data were loaded into GraphPad Prism 8 for statistical analysis.

**RESULTS:** Average LP size decreased as ISO incubation time prolonged (113.67 ± 2.40, 115.69 ± 2.21, 83.61 ± 1.69, 35.00 ± 0.88, 31.60 ± 0.77 ± 2.40, 115.69 ± 2.21, 83.61 ± 1.69, 35.00 ± 0.88, 31.60 ± 0.77, 22.00 ± 0.67, 15.69 ± 0.55, 11.73 ± 0.55, 4.19, 3.82 ± 0.87, 3.73 ± 0.65 μm at ISO and 0.05 µM NS-398 slowed down the rate of LP size reduction (95.08 ± 1.65, 107.73 ± 2.26, 85.22 ± 1.87, 56.97 ± 1.49, 41.32 ± 0.87, 37.43 ± 0.65 μm at ISO, respectively; slope [−53.04 ± 1.21 vs. −65.45 ± 1.33] LP size distribution showed a shift of LP size towards smaller LPs following incubation with ISO. Inhibition of COX2 activity can delay the occurrence of lipid shift (became smaller) of LP size distribution (12h vs. 3h). UCPI expression was lower following ISO and NS-398 incubation than those treated with ISO only (0.74 ± 0.08 vs. 1.00 ± 0.00, P<0.05).

**CONCLUSION:** COX2 inhibition can repress ISO induced adipolysis in BACs and may related to a decrease in UCPI expression.

Funded by FRF for the Central Universities of China (2018GJ0179).

Maximal fat oxidation (MFO, in g−1 %VO2max) is an index of metabolic flexibility and the relative exercise intensity at MFO (FATmax), as % maximum oxygen consumption (VO2max), is used for exercise prescription for weight loss and metabolic health. The time-consuming, steady-state protocol required for MFO/FATmax determination hinders the extensive use of these indexes. Alternative, ramp testing has been validated for MFO/FATmax measure in post-menopausal women.

**METHODS:** 18 sedentary, postmenopausal women (54±4 years; 13±3 years from menopause; 22±3 BMI) performed on a cycle ergometer: i) a ramp incremental test; ii) steady-state trials at 40, 50, 60, 70 and 80% of the VO2max as determined by the steady-state protocol (5 min of each trial) we measured absolute fat oxidation (FO, in g·min−1); then, we determined MFO in absolute units (in g·min−1) and the relative intensity corresponding to MFO, i.e. FATmax, that was expressed relative to VO2max and directly maximized HR (HRmax) and MFO and FATmax from the ramp (MFO and FATmax) were compared to the values from the steady-state protocol (MFO and FATmax) by paired t-Test.

**RESULTS:** The MFO was significantly lower than MFO (0.39±0.13 vs 0.19±0.07 g·min−1;*p*<0.001). On the contrary, the FATmax and FATmax occurred at an identical %VO2max (45.16 vs 47.53%; *P*=0.17) and %HRmax (61.16 vs 62.6%; *P*=0.54).

**CONCLUSIONS:** In agreement with previous studies conducted in young males, our data confirm that only steady-state protocols allow accurate MFO quantification. On the contrary, accurate measures of FATmax can be obtained indifferently from both ramp and steady-state protocols in post-menopausal women. Therefore, ramp testing offers a valid alternative to more time-consuming steady-state protocols for the identification of
Exercise can ameliorate Type 2 Diabetes (T2D), and studies also show that exercise may prevent the onset of T2D. Thus, postmenopausal women may be at a greater risk for T2D. While the effects of exercise, estrogens, and diet on whole body risk factors for T2D are established, little is known about the cellular changes in the liver that account for these whole body beneficial effects. PURPOSE: To examine the effects of exercise, estrogens and diet on hepatic protein expression. METHODS: Female Wistar rats were fed a standard diet (SD) or a high-fat diet (HFD) for 10 weeks. A subset of the rats had their ovaries removed via ovarioectomy (OVX). The rats were given treatment of treadmill exercise (25 minutes/day at 40 cm/s for 5 days/week (Ex)) or estradiol replacement (E2; 1 µg/day). At the end of the study, the liver was removed and homogenized in cell extraction buffer, and the protein was isolated. Western blot analyses were performed to measure the expression of the following proteins involved in lipid metabolism and mitochondrial function: acetyl-CoA carboxylase (ACC), fatty acid synthase (FAS), hormone sensitive lipid (HSL), lipoprotein lipase (LPL), citrate synthase, and cytochrome c oxidase (COX) IV. RESULTS: The HFD decreased the ACC expression compared to the SD (0.49 vs. 0.93 AU, p<0.05), and E treatment restored these values (0.81 AU, p<0.05). Similarly, the HFD decreased the FAS expression compared to the SD (0.44 vs. 1.58 AU, p<0.05), and E treatment restored these values (0.75 AU, p<0.05). The HFD increased the LPL expression compared to the SD (1.58 vs. 1.15, p<0.05), and E treatment decreased the LPL expression (1.32 AU, p<0.05). There was no effect of Ex on the ACC, FAS, or LPL expression. The expression of the HSL, citrate synthase, and COX IV did not change with diet, E2 replacement, or Ex. CONCLUSION: Two proteins that stimulate de novo fatty acid synthesis (ACC and FAS) decreased with the HFD, likely due to the exogenous intake of fats. Notably, E2 replacement increased the ACC and FAS expression, even though the HFD was still being consumed. LPL is a protein that stimulates fat storage. Consumption of the HFD increased the LPL expression to increase fat storage, and E2 replacement decreased the LPL expression. Thus, E2 may provide benefits by decreasing fat storage. Supported by NIH Grant 2P20GM103443 and NSF Grant IIA-1355423.

Ethnicity Mediates The Magnitude Of Change In Fat Oxidation In Response To High Intensity Interval Training (HIIT) One response to high intensity interval training (HIIT) is increased fat oxidation (FOx) (Astorino et al. 2017) which is due to enhanced oxidative capacity and activity of β-HAD (Talanian et al. 2007). In the U.S., Hispanic adults have a higher rate of obesity than Caucasians (Hales et al. 2017), and have twofold higher rate of diabetes (CDC 2018). It is unknown if ethnicity alters FOx responses to HIIT. PURPOSE: To assess the role of ethnicity in mediating FOx changes with HIIT. METHODS: Eleven inactive Caucasian (C) and 7 Hispanic women (H) (age = 25 ± 6 yr) participated in the study. Initially, VO2max and peak power output (PPO) were determined. On two separate days after a minimum 6 h fast, they completed five stages of progressive and homogenous exercise at 10 - 50 %PPO during which gas exchange data were acquired to calculate RER, FOx, and carbohydrate oxidation (CHOx). Fingertip blood samples were used to measure blood lactate concentration (BLA). HIIT consisted of 9 sessions of cycling at 85 %PPO separated by 75 s recovery. RESULTS: HIIT increased VO2max by 10 and 8 % in C and H with no effect of ethnicity (p = 0.69). RER increased during exercise (p < 0.001) and timeXtraining (p = 0.001) and timeXtrainingXgroup interactions (p = 0.012) were shown. Fat oxidation differed during exercise (p = 0.001) and there was a timeXtrainingXgroup interaction (p = 0.03). Post hoc analyses showed significantly higher FOx post-HIIT at 10 (1.09 vs. 0.94 g/min vs. 0.16 vs. 0.44 g/min) and 20 %PPO (0.17 ± 0.03 vs. 0.14 ± 0.04 g/min) versus baseline in H. Data showed a 10 - 35 % reduction in CHO oxidation (p = 0.01) after HIIT and a timeXtraining interaction (p = 0.01), but no timeXtrainingXgroup interaction (p = 0.32) was shown. BLA increased during progressive exercise (p < 0.001) and there was a reduction in BLA during exercise in response to training (p = 0.002) that was similar in C and H (p = 0.28). CONCLUSION: These preliminary data obtained in inactive women suggest that ethnicity may alter changes in energy metabolism observed in response to short-term interval training. Further work is needed to examine the mechanisms underpinning this potential effect of ethnicity on adaptation to training. This work was funded by a Research and Scholarly Activity Grant.

Cardiovascular disease (CVD) is a pandemic that is the leading cause of death for women in the United States. This is particularly alarming as the primary etiologies for CVD are lifestyle related Nutrition interventions, such as well-formulated ketogenic diets (WKFD), improve metabolic health and reduce risk factors associated with CVD but it is unknown if these improvements in health can be observed within the first three weeks of carbohydrate restriction. Purpose: The purpose of this study was to examine the effectiveness of a WKFD on women’s metabolic health. Methods: Twenty-two women (Age yr) (42 ± 8.1, Ht. (cm) 164.2 ± 5.9, BMI 27.3 ± 6.0) participated in a 21-day, eucaloric diet study. Anthropometrics, body composition (InBody 570), fasted capillary-blood ketones, glucose (BG), and cholesterol panel, and diet records were
collected before (PRE) and after (POST) intervention. **Results:** Women maintained calories (PRE: 1938kcal vs POST: 1836kcal) and protein levels (PRE: 17% vs POST: 20%) but decreased dietary carbohydrate (PRE: 36% vs POST: 13%) and increased dietary fat (PRE: 45% vs POST: 65%) PRE to POST (p<0.05). Weight (PRE: 73.9kg vs POST: 72.3kg) and body fat (PRE: 56.9kg vs POST: 54.8kg) significantly decreased but there were no differences in lean body mass PRE to POST (p<0.05). **BG (PRE: 94.0mmol/L vs POST: 89.6mmol/L) decreased significantly, with 73% of women decreasing BG from PRE to POST (p<0.05). Ketone increased significantly and 58% of women reached nutritional ketosis by POST testing (p<0.05). There were no differences in cholesterol panel except for LDL, which increased from (PRE 111mg/dL) to POST (124.2mg/dL) (p<0.05). **Conclusion:** Women’s metabolic health is an immediate concern for the silent killer known as CVD in this population. Finding safe, systemic interventions to this pandemic are imperative. WFKD improved some, but not all, metabolic markers within 21 days. This highlights the initial shifts in metabolic health related to WFKD nutritional interventions and calls for additional research to help better understand the underlying mechanisms of WFKD on metabolic health, especially as it relates to cholesterol metabolism, and the timeline of these events.

**Purpose:** Long-term intake of very low-carbohydrate, high-fat (ketogenic) diets enhance production and utilization of ketone bodies, which are more energy-efficient fuels for skeletal muscle. However, adaptation to the extremely low-carbohydrate diet has been shown to upregulate pyruvate dehydrogenase kinase 4 (PDK4) content in skeletal muscle, which is a negative regulator of glycolytic flux, resulting in the impaired high-intensity exercise capacity. Because medium-chain triglyceride (MCT) can produce more ketone bodies than long-chain triglyceride (LCT), incorporating MCT into the diet may allow more carbohydrates yet preserving ketosis and exert less inhibitory effect on muscle glucose metabolism. The purpose of this study was therefore to examine the effects of long-term feeding of ketogenic diet containing MCT on the endurance training-induced adaptations in metabolic enzymes of rat skeletal muscle. **Methods:** Male Sprague-Dawley rats (7-week-old) were placed on a standard diet (PFC ratio = 21:16:63), LCT-containing ketogenic diet (LKD, PFC ratio = 12:87:1) or MCT-containing ketogenic diet (MKD, PFC ratio = 16:66:18) for 8 wks. Half the rats in each group performed 2-h swimming exercise, 5 days a week for 8 wks. After the 8-wk intervention, protein expression of 3-oxoacid CoA transferase 1 (OXCT, a ketolytic enzyme) and PDK4 in epitrochlearis muscle were measured.

**Results:** Despite the lower lipid content in the diet, plasma β-hydroxybutyrate concentration in the MKD-fed rats increased to a level similar to that attained in the rats fed the LKD (17±0.7 vs 83±18 mmol/L, p=0.99). Endurance training significantly increased OXCT protein content in epitrochlearis muscle and moreover, intake of the MKD additively enhanced the endurance training-induced increase in OXCT protein content. PDK4 protein level in skeletal muscle was substantially increased after the LKD consumption. However, such increase in the PDK4 was not observed in the MKD-fed rats regardless of endurance training status.

**Conclusion:** Long-term intake of ketogenic diet containing MCT may additively enhance endurance training-induced ketone bodies utilization capacity in skeletal muscle without exerting inhibitory effects on glucose metabolism.
Decline in mitochondrial function is associated with a decrease in lifespan. We have previously demonstrated that a long-term ketogenic diet (KD) improves mitochondrial function and longevity. However, a life-long KD is difficult to maintain and an intermittent KD might be more viable long term.

**RESULTS:** Following one day of KD, neither acetylated, nor mitochondrial proteins increased in the liver, kidney and gastrocnemius muscle. Specifically, acetylation of p300 was 3.4±0.89-fold greater following 7 days of KD. Unlike the proteins increased in the liver, kidney and gastrocnemius muscle. Specifically, acetylation of p300 was 3.4±0.89-fold greater following 7 days of KD. Unlike the other tissues the brain showed no difference in acetylated proteins by 7 days. An increase in mitochondrial mass was only seen in the liver at 7 days of KD.

**CONCLUSIONS:** A short term ketogenic diet can be used to rapidly alter protein acetylation in the liver, kidney and muscle. These data suggest that an intermittent diet may be useful in promoting a biochemical change in muscle that promotes mitochondrial function and may benefit long-term muscle function.

**RESULTS:** Differences were found in the measures of 12 of the 27 volunteers. However, most of the researchers relied on small sample sizes or specific populations.

**METHODS:** Four C57BL/6 mice were fed a control diet or 1 or 7 days of continuous KD. At the time of sacrifice, livers, gastrocnemius, brain and kidneys were extracted and frozen in liquid nitrogen before being powdered and homogenized in sucrose lysis buffer and prepared for western blot analysis to determine total acetylated byssine content, total OXPHOS protein, or acetylated p300 content.

**RESULTS:** Following one day of KD, neither acetylated, nor mitochondrial proteins were different than control diet. By seven days of KD, total acetylated proteins increased in the liver, kidney and gastrocnemius muscle. Specifically, acetylation of p300 was 3.4±0.89-fold greater following 7 days of KD. Unlike the other tissues the brain showed no difference in acetylated proteins by 7 days. An increase in mitochondrial mass was only seen in the liver at 7 days of KD.

**CONCLUSIONS:** A short term ketogenic diet can be used to rapidly alter protein acetylation in the liver, kidney and muscle. These data suggest that an intermittent diet may be useful in promoting a biochemical change in muscle that promotes mitochondrial function and may benefit long-term muscle function.

**RESULTS:** Differences were found in the measures of 12 of the 27 volunteers. However, most of the researchers relied on small sample sizes or specific populations.

**METHODS:** Four C57BL/6 mice were fed a control diet or 1 or 7 days of continuous KD. At the time of sacrifice, livers, gastrocnemius, brain and kidneys were extracted and frozen in liquid nitrogen before being powdered and homogenized in sucrose lysis buffer and prepared for western blot analysis to determine total acetylated byssine content, total OXPHOS protein, or acetylated p300 content.

**RESULTS:** Following one day of KD, neither acetylated, nor mitochondrial proteins were different than control diet. By seven days of KD, total acetylated proteins increased in the liver, kidney and gastrocnemius muscle. Specifically, acetylation of p300 was 3.4±0.89-fold greater following 7 days of KD. Unlike the other tissues the brain showed no difference in acetylated proteins by 7 days. An increase in mitochondrial mass was only seen in the liver at 7 days of KD.

**CONCLUSIONS:** A short term ketogenic diet can be used to rapidly alter protein acetylation in the liver, kidney and muscle. These data suggest that an intermittent diet may be useful in promoting a biochemical change in muscle that promotes mitochondrial function and may benefit long-term muscle function.
BACKGROUND: Indirect calorimetry (IC) is the gold standard method to assess individual resting energy expenditure (REE). However, due to its high cost and time demand, predictive equations are largely used to estimate energy requirements, which may vary according to different body compositions and health status. Crossfit® is a training program created by Greg Glessman in 1995 and consists of performing high intensity functional movements. Some studies have already reported increase of metabolic rates in this population.

PURPOSE: To measure REE in Crossfit® practitioners, using IC, and verify the most appropriate predictive equation to estimate this variable.

METHODS: 142 Crossfit® practitioners, 91 female (64.1%), aged between 16-59 years, underwent nutritional assessment, including weight, height, waist circumference (WC) and body mass index (BMI). Body composition was measured by a portable ultrasound. REE was measured by IC (mREE) and predicted by six different equations (pREE): Harris-Benedict, World Health Organization (WHO), Henry and Rees Cunningham (1980), Cunningham (1991), and Mifflin-St.Jeor. Statistical analysis were carried out by Kolmogorov-Smirnov Test, Student’s t-test and Bland and Altman plots.

RESULTS: The mean age was 33.0 ± 6.3 years of age, without difference between test and Bland and Altman plots. Cunningham (1980), Cunningham (1991), and Mifflin-St.Jeor. Statistical analysis were appropriate predictive equation to estimate this variable.

PURPOSE: To measure REE in Crossfit® practitioners, using IC, and verify the most appropriate predictive equation to estimate this variable.

METHODS: 142 Crossfit® practitioners, 91 female (64.1%), aged between 16-59 years, underwent nutritional assessment, including weight, height, waist circumference (WC) and body mass index (BMI). Body composition was measured by a portable ultrasound. REE was measured by IC (mREE) and predicted by six different equations (pREE): Harris-Benedict, World Health Organization (WHO), Henry and Rees Cunningham (1980), Cunningham (1991), and Mifflin-St.Jeor. Statistical analysis were carried out by Kolmogorov-Smirnov Test, Student’s t-test and Bland and Altman plots.

RESULTS: The mean age was 33.0 ± 6.3 years of age, without difference between test and Bland and Altman plots. Cunningham (1980), Cunningham (1991), and Mifflin-St.Jeor. Statistical analysis were appropriate predictive equation to estimate this variable.

CONCLUSIONS: This study showed that Cunningham (1991), WHO (1985) and Harris-Benedict (1919) equations were the most appropriated REE equations for Crossfit® practitioners. Further studies should investigate more suitable methods to determine the energy requirements in Crossfit® and should, permits, create and propose a specific equation for this population.

Exercise is a modality that may result in an elevation of resting metabolic rate (RMR) due to homestatic drive. Sprint Interval Training (SIT) exercise is widely recognized as a time efficient, low-volume, high-intensity alternative to endurance training and, in acute phases, may elevate RMR for longer durations. PURPOSE: To compare the effects of an acute bout of SIT vs. steady state (SS) vs. control (CON) on 24-h RMR in recreationally active college-aged males. METHODS: In this randomized crossover design, 13 recreationally active males ages 18-30 yrs, (24.1 ± 2.3) participated in three exercise sessions using an electronically braked cycle ergometer: SIT (5, 30-sec. sprints, interspersed with 4-min. active recovery), SS (70% of VO2peak for 30 min.) and CON. Each session included 7 RMR measurements taken at the same times over a 24-h period (3m resting, 8-min pre-ex, 16.10pm post-ex, 12:10pm 2-h post-ex, 1-00pm 3-h post-ex, 4:00pm 6-h post-ex and 10:00am the following morning 24-h post-ex). RMR comparisons were made using two-way ANOVA with repeated measures. RESULTS: There was: a significant main effect for group with regard to RMR (F=5.706; p=0.043) with no effect of time (F=5.351; p=0.113) or group x time interaction (F=1.486; p=0.066). There was a significant difference between SS (2116 kcal) and CON (1891 kcal) (p=0.009) and SIT (2105 kcal) and CON (1891 kcal) (p=0.012). SS (2116 kcal) and SIT (2105 kcal) were not different (p=0.994). There was a significant effect for time between combined exercise (CE) condition vs. CON when comparing rest to pre (ACE = 582 kcal vs. ΔCON = 498 kcal) (p=0.002), rest to post-ex (ΔACE = 628 kcal vs. ΔCON = 211 kcal) (p=0.034), and rest to 6-h post (ACE = 716 kcal vs. ΔCON = 193 kcal) (p=0.016). There was a significant group x time interaction for CE vs. CON (p = 0.034). Post-hoc analysis revealed statistical differences in measurements 2-h post (p=0.018; 455 kcal), 3-h post (p=0.002; 599 kcal) and a trend towards statistical significance at 6-h post (p=0.076; 340 kcal) and 24-h post (p=0.103; 313 kcal). CONCLUSION: A single bout of SIT may significantly elevate post-exercise RMR, and if repeated regularly, may confer longer-term benefits similar to that produced by 30 minutes of SS exercise.

Decrease in energy availability (EA) theoretically reduce basal metabolic rate (BMR) with sacrificing reproduction or bone health. However, research in EA of Asians is scarce and there is no data of EA as a determinant of BMR in adolescent athletes.

PURPOSE: To reveal the relationship between BMR and EA in free-living Japanese competitive girl runners.

METHODS: Consecutive 14 girl runners (16.7 ± 0.7 y/o, 161.0 ± 6.3 cm, 45.2 ± 5.4 kg) in the same competitive high school team were evaluated without control on food and exercise. Each runner was asked to report dietary records with photos and training logs for 7 days. Energy intake (EI) was assessed by registered nutritionists. The runners were tested on treadmill with indirect calorimeter to yield individual prediction equations for VO2 by running velocity. Exercise energy expenditure (EEE) was calculated by the equations based on the training log. EA was calculated by subtracting EEE from EI for each day. The daily means of those variables were calculated. BMR was measured by whole room calorimeter in the early morning after overnight sleep at the night of the last day of the assessment inside the calorimeter. Body composition was measured by DXA. Bivariate correlation analyses and t-test were used to examine the relationships and the difference between variables and groups, respectively.

RESULTS: Percent body fat (%BF), fat free mass (FFM), and bone mineral density of TBLH (BMD) were 13.3 ± 4.5%, 39.0 ± 3.5 kg, and 1.013 ± 0.042 g/cm2, respectively. BMR, EI, and EEE were 26.5 ± 2.4 kcal/kgFFM/day, 2330 ± 479 kcal/day, 892 ± 245 kcal/day, and 37.4 ± 10.7 kcal/kgFFM/day, respectively. EA was significantly lower in T1 (MD ± SD; 281 ± 396 kcal/day, p=0.001) and T2 (MD ± SD; 215 ± 396 kcal/day, p=0.001) than T3 (MD ± SD; 3.2 ± 8.6%, p=0.001). Difference in FM contribution between T1 and T2 lacked significance (p=0.210), but T3 had a significantly higher FM contribution than T1 (MD ± SD; 5.1 ± 7.0%, p=0.001) and T2 (MD ± SD: 3.9 ± 7.0%, p=0.001).

CONCLUSIONS: Despite similarities in SM, women with elevated %fat experienced lower SM contribution and higher FM contribution to REE. As adiposity increases, REE decreases; FM may explain more of the variance in REE between women of different levels of adiposity.
correlated with BMI (r = 0.60, p < 0.02). However, EA was not correlated with either %BF (p = 0.25) or BMD (p = 0.16) and did not differ between runners with oligo-amenorrhea (n = 7; 40.8 ± 11.9) and amenorrhea (n = 6; 34.0 ± 9.8) (p = 0.29).

CONCLUSIONS: The strong linear correlation between EA and BMI supports the theory that decrease in EA leads to compensatory adaptation in metabolism which may suppress reproduction or bone mineral accrual. However, arbitrarily evaluated EA in short-term was not related to the triad associated conditions. Those results were consistent with the evidences from adult Caucasian population.

G-41 Free Communication/Poster - Thermogenic Dietary Supplements
Saturday, May 30, 2020, 8:00 AM - 10:30 AM
Room: CC-Exhibit Hall

BACKGROUND: Global increases in the incidence of obesity and the ensuing clinical co-morbidities has increased interest in the use of thermogenic supplements formulated to increase resting metabolism to increase energy expenditure and fat utilization. PURPOSE: The purpose of this study was to assess the effect of new capsinicin-based thermogenic supplements on resting oxygen consumption (VO2), carbon dioxide production (VCO2) and respiratory quotients (RQ). METHODS: Twenty-two untrained females (21.1 ± 4.2 years) visited the lab on six occasions for measurements of pre-supplementation (PRE) resting energy expenditure (REE) for 30-60 min followed by the ingestion of a placebo or supplement (Shred, Shred 2.0, Capsimax 50, Capsimax 100, Capsimax 200) with at least three days separating conditions. Resting VO2, VCO2, and RQ were re-assessed for 90-120 minutes post-supplementation (POST). Changes in metabolic markers between treatment groups and over time were assessed in 5-minute intervals over the course of the 90-minute measures ANOVA was utilized to determine differences between the PL and the 5-HES conditions. No interaction effects (time*treatment) or treatment differences in metabolic markers. Observed time effects are postulated as a result of the elevated changes in metabolic markers between treatment groups and over time were assessed in 5-minute intervals over the course of the 90-minute measurements. There was no statistically significant difference at p < 0.05. * indicates statistical significance between conditions (p < 0.05).

CONCLUSIONS: The strong linear correlation between EA and BMI supports the theory that decrease in EA leads to compensatory adaptation in metabolism which may suppress reproduction or bone mineral accrual. However, arbitrarily evaluated EA in short-term was not related to the triad associated conditions. Those results were consistent with the evidences from adult Caucasian population.

3956 Board #273 May 30 9:00 AM - 10:30 AM
Effect Of 5-hour Energy Shot® On Physiological And Performance Responses To Simulated Car Racing
Philip J. Buckenmeyer, Jeff A. Bauer, James F. Hokanson, Stephen P. Yang, Joy L. Hendrick, Daniel Tammaro, Larissa True. SUNY Cortland, Cortland, NY. Email: buckenmeryp@cornell.edu

The 5-Hour Energy Shot® continues to be one of the more popular energy drinks on the market. The maker claims that it improves work and/or exercise performance. PURPOSE: To determine if ingesting one 5-Hour Energy Shot® compared to a placebo causes measurable improvement in performance related to physiological variables during a simulated driving task (SDT). METHODS: Nineteen (11 males, 8 females), college-aged (21.8 ± 1.55 yrs; 1.7 ± 0.11 m in ht; 72.9 ± 13.8 kg in wt), volunteer participants participated in a double-blind, cross-over, placebo-based study. The participants were tested prior to and then at 5 consecutive 1-hour intervals after ingesting either a randomly assigned non-caffeinated placebo (PL) (5 ml; 5 kcal) or the 5-Hour Energy Shot® (5HES) (59 ml; 5 kcal) or the 5-Hour Energy Shot® (5HES) (59 ml; 4 kcal). The SDT was a solo-timed road race (Forza Horizon game) on an Xbox 360 gaming system. During each of the 6-data collection trials, heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), ear temperature (ETemp), skin temperature (STemp), drive time (DT), and number of crashes (CR) were recorded. Subjects were also evaluated for alertness and drive effectiveness at each of same time points. A 2-way repeated measures ANOVA was utilized to determine differences between the PL and the 5-HES treatments across the six test periods of the driving task. Significance was established at p < 0.05. SUMMARY OF RESULTS: There was no statistically significant difference between PL and 5-HES across the six time periods relative to HR, SBP, DBP, ETemp, or CR driving. However, the 5-HES group had a significantly lower STemp than the PL group at each time interval; with a 5-hour post-ingestion STemp of 89.55 ± 2.3°F in the 5-HES group compared to 90.27 ± 1.96°F in the PL group. The 5-HES group had a faster DT compared to the PL group at each of the time intervals; with a 5-hour post-ingestion DT of 197.47 ± 50.39 sec in the 5-HES group compared to 201.09 ± 52.38 sec in the PL group. CONCLUSIONS: When compared to a placebo, 5-Hour Energy Shot® did significantly improve driving time, along with a concomitantly reduced skin temperature in college-aged participants during a simulated driving task.
Esports, or competitive video gaming, requires persistent cognitive functioning, alertness, quick reaction time, and mental clarity. As Esports has gained attention, more research is justified to elucidate performance enhancing strategies. Interestingly, Esports supplements aided to improve reaction time, focus, and energy levels have yet to be heavily investigated. PURPOSE: To examine the impact of an Esport specific supplement on Esports performance and physiological responses. METHODS: Fifteen males (age = 22.0 ± 1.1 yrs, ht = 181.7 ± 10.2 cm, wt = 83.6 ± 14.5 kg, gaming = 13.9 ± 6.6 hrs) participated in the study. After completion of a baseline familiarization session including an Esports aim trainer (AT), subjects completed 2 performance sessions in a counterbalanced crossover design. Participants were given an Esports supplement (SUP) [caffeine, L-Theanine, Ginkgo Biloba, Vitamin B6, D3, B12] or placebo (PLA) 30 minutes prior to starting AT. During AT sessions, 3 rounds of 3 tests were completed: classic (CLA), reflex (RE), and simple (SIM) and 1 round of time trial (TT). During each test, score (SCO), accuracy (ACC), and time per hit (TPH) were recorded, as well as time to completion (TTC) during CLA and RE. Before and after AT, BP and 5min resting HR and HV were assessed. Subjects were asked mental fatigue and alertness prior to and after AT, along with SRPE after AT. Paired samples t-tests with an alpha level at p < 0.05 were used to compare measures of HR, HV, BP, peak ACC, peak SCO, peak TPH, and peak TTC between SUP and PLA. RESULTS: There were no significant differences between SUP or PLA in regard to ACC (CLA 91.3 ± 3.0 vs 90.3 ± 4.4 %, RE 40.7 ± 12.9 vs 39.2 ± 12.0 %, SIM 61.7 ± 14.1 vs 61.7 ± 17.8 %, TT 48.0 ± 14.9 vs 49.7 ± 14.2 %, p > 0.05), SCO (CLA 116357.1 ± 607067 vs 113642.9 ± 51013.7, RE 45839.3 ± 21961.1 vs 42339.1 ± 27278.2, SIM 40964.3 ± 22276.6 vs 38992.9 ± 24041.8, TT 167143.3 ± 20364.7 ± 20000.0 ± 18630.0, p ≥ 0.05), TPH (CLA 0.6 ± 0.1 vs 0.6 ± 0.1 sec, SIM 1.9 ± 0.5 vs 1.9 ± 0.5 sec, TT 1.85 ± 0.17 ± 1.75 ± 0.05 sec, p ≥ 0.05), and TTC (CLA 85.9 ± 23.1 vs 90.7 ± 15.4 sec, TT 177.5 ± 59.7 ± 161 ± 53.1 sec, p > 0.05). CONCLUSION: SUP did not improve Esports performance during AT compared to PLA. This could be due to dosage, AT used, and level of experience of participants.

Methylbenzethionine (Dynamine; DYDM) and theacrine (Teacrine; TCR) are purine alkaloids. Previous research on TCR reported increases in feelings of energy, focus, and concentration, and decreases in fatigue. Currently, there are no published human safety data on DYDM. PURPOSE: The purpose of this study was to examine the effect of four weeks of DYDM supplementation with and without TCR on blood biomarkers. METHODS: One-hundred twenty-five men (n = 60) and women (n = 65) were of four weeks of DYDM supplementation with and without TCR on blood biomarkers. Participants were assigned to a multivitamin supplement (LIQ; n=11), multivitamin capsule (CAP; n=11), or placebo (PLA; n=22) on three test occasions (week 0 and week 4, separated by four weeks of supplementation, 25 mg) , and 125 mg maltodextrin. Participants visited the laboratory fasted on two occasions (week 0 and week 4), separated by four weeks of supplementation, for a blood draw. Blood was analyzed by an independent third-party (i.e. LabCorp). Three-way repeated measures analyses of variance were performed for each blood draw. Blood was analyzed by an independent third-party (i.e. LabCorp).

**RESULTS:**
- **Red Blood Cell (RBC) Indices:**
  - Hemoglobin: 13.9 ± 6.6 hrs) participated in the study. After completion of a baseline familiarization session including an Esports aim trainer (AT), subjects completed 2 performance sessions in a counterbalanced crossover design. Participants were given an Esports supplement (SUP) [caffeine, L-Theanine, Ginkgo Biloba, Vitamin B6, D3, B12] or placebo (PLA) 30 minutes prior to starting AT. During AT sessions, 3 rounds of 3 tests were completed: classic (CLA), reflex (RE), and simple (SIM) and 1 round of time trial (TT). During each test, score (SCO), accuracy (ACC), and time per hit (TPH) were recorded, as well as time to completion (TTC) during CLA and RE. Before and after AT, BP and 5min resting HR and HV were assessed. Subjects were asked mental fatigue and alertness prior to and after AT, along with SRPE after AT. Paired samples t-tests with an alpha level at p < 0.05 were used to compare measures of HR, HV, BP, peak ACC, peak SCO, peak TPH, and peak TTC between SUP and PLA. RESULTS: There were no significant differences between SUP or PLA in regard to ACC (CLA 91.3 ± 3.0 vs 90.3 ± 4.4 %, RE 40.7 ± 12.9 vs 39.2 ± 12.0 %, SIM 61.7 ± 14.1 vs 61.7 ± 17.8 %, TT 48.0 ± 14.9 vs 49.7 ± 14.2 %, p > 0.05), SCO (CLA 116357.1 ± 607067 vs 113642.9 ± 51013.7, RE 45839.3 ± 21961.1 vs 42339.1 ± 27278.2, SIM 40964.3 ± 22276.6 vs 38992.9 ± 24041.8, TT 167143.3 ± 20364.7 ± 20000.0 ± 18630.0, p ≥ 0.05), TPH (CLA 0.6 ± 0.1 vs 0.6 ± 0.1 sec, SIM 1.9 ± 0.5 vs 1.9 ± 0.5 sec, TT 1.85 ± 0.17 ± 1.75 ± 0.05 sec, p ≥ 0.05), and TTC (CLA 85.9 ± 23.1 ± 90.7 ± 15.4 sec, TT 177.5 ± 59.7 ± 161 ± 53.1 sec, p > 0.05). CONCLUSION: SUP did not improve Esports performance during AT compared to PLA. This could be due to dosage, AT used, and level of experience of participants.

**CONCLUSIONS:** While small changes were found in some biomarkers, in all cases values remained within normal clinical limits. This suggests that DYDM alone or in combination with TCR consumed at the dosages used in this study does not appear to negatively impact blood biomarkers associated with health.

Compound Solutions, Inc. grant

Vitamin D deficiency is prevalent among active adults. Commonly, individuals opt to consume a multivitamin product to correct this deficiency. However, many multivitamins are often under-dosed compared to current evidenced-based recommendations. Furthermore, some companies offer a variety of vitamin formulations, with the claim of improving nutrient absorption. PURPOSE: To compare the effects of two different forms (liquid vs. capsule) of low-dose multivitamins on 25(OH) vitamin D status following 10-weeks of supplementation. METHODS: Thirty-two healthy males (n=15, 20.1y, 163cm, 71.7kg) and females (n=19, 22.1y, 153.4cm, 69.8kg) participated in this randomized, double-blind, placebo-controlled study. At the beginning of the 10-week intervention, participants provided a resting, fasted baseline blood sample and were randomly assigned to a liquid multivitamin supplement (LIQ; n=11), multivitamin capsule (CAP; n=11), or placebo group (PL; n=12). Participants took their respective supplement daily for 10 weeks. To maintain the double-blind study design, each participant consumed a combination of a liquid and capsule product. Placebo liquids and capsules were balanced so each group (LIQ, CAP, PL) consumed only their correct active (or placebo) treatment. The LIQ and CAP supplement both contained 268 IU of Vitamin D. Compliance was tracked by collecting empty supplement containers each week. After the 10 weeks, all participants reported back to the laboratory for a resting, fasted blood sample. Plasma samples were assayed for 25(OH) vitamin D concentrations. Data were analyzed using a 2-way repeated measures analysis of variance (ANOVA).

**RESULTS:** There was a main effect for time (F=11.86, p<0.002, ηp2=0.227) with 25(OH) vitamin D concentrations significantly lower (A: -7.8±14.9ng/mL) at post-tasting. Further, there were no significant differences between treatments (F=0.200, p=0.654, ηp2=0.013) in 25(OH) concentrations suggesting no benefit of LIQ or CAP supplementation over PL.

**CONCLUSION:** It appears that a chronic low dose of vitamin D in liquid or capsule form is insufficient to maintain or elevate 25(OH)D concentrations in healthy, college-aged adults. Consumers should evaluate their doses of the multivitamins compared to current evidence-based recommendations.

25-hydroxyvitamin D (25(OH)D) is hydroxylated in the liver to its biologically active form, 1,25 dihydroxyvitamin D (1,25(OH)2D), and its catabolic form, 24,25 hydroxyvitamin D (24,25(OH)2D). The effect of vitamin D supplementation on the production of 1,25(OH)D1 and 24,25(OH)D1 is unknown. PURPOSE: To examine the effect of oral vitamin D supplementation versus simulated sunlight on vitamin D metabolites and parathyroid hormone (PTH) during 13-weeks of military training.

**METHODS:** Eighty male infantry recruits (mean ± SD, age 22 ± 3 years, height 1.78 ± 0.07 m, body mass 77.9 ± 10.7 kg) received oral vitamin D3 (OD3, 1,000 IU D3 for 4 weeks and then 400 IU D3 for 8 weeks, n = 21) and placebo (PL; n = 19), solar-simulated radiation (SSR, 1,3 × standard erythemal dose in T-shirt and shorts, 3 d/wk) for 4 weeks and 1 d/wk for 8 weeks, n = 22), or placebo SSR (SSR-P, n = 39).

**CONCLUSIONS:** While small changes were found in some biomarkers, in all cases values remained within normal clinical limits. This suggests that DYDM alone or in combination with TCR consumed at the dosages used in this study does not appear to negatively impact blood biomarkers associated with health.
Conducting Vitamin D3 Supplementation To Observe Serum 25(OH)D Levels, Body Composition, And Depression In Athletes

Rachel L. Darr¹, Jeremy Glaser¹, Kyle Chapman¹, Allison Gregory¹, Brian Purchase¹, John Ledyard², Saginaw Valley State University, University Center, MI. *University at Buffalo, Buffalo, NY.

Email: rldarr@svsu.edu

(Vitamin D insufficiency is linked with muscle weakness and adequate levels can improve muscle performance. Secondly, Vitamin D is stored in fat via fat sequestration and has ties to depression. Athletes in preseason use copious amounts of sunlight have no effect on the biological activity of Vitamin D, but increase the production of the calcitriol metabolite 24,25(OH)D.)

Vitamin D3 has been widely studied for its role in regulating calcium and bone metabolism. Further research is warranted with a larger active athletic population over a longer period of supplementation to perhaps see any definitive relationships in 25(OH)D and depression or in comparison to body composition, and to continue detecting levels after stopped supplementation.

Board #278
May 30 9:00 AM - 10:30 AM

Conducting Vitamin D3 Supplementation To Observe Serum 25(OH)D Levels, Body Composition, And Depression In Athletes

Rachel L. Darr¹, Jeremy Glaser¹, Kyle Chapman¹, Allison Gregory¹, Brian Purchase¹, John Ledyard², Saginaw Valley State University, University Center, MI. *University at Buffalo, Buffalo, NY.

Email: rldarr@svsu.edu

No relevant relationships reported

Vitamin D deficiency has been previously associated with impaired metabolic functions which may impact the acute effects of resistance exercise (RE) on insulin sensitivity, inflammation, and muscle damage. The effects of exogenous vitamin D on the metabolic, inflammatory, and muscle damage responses to an acute bout of RE in vitamin D deficient subjects have yet to be explored.

Purpose: To evaluate the effects of a single vitamin D3 injection on the metabolic, inflammatory and muscle damage responses to an acute bout of RE in vitamin D-deficient resistance-trained males.

Methods: Blood samples from 14 vitamin D-deficient resistance-trained males were obtained during two separate trials: lower vitamin D (LVD, after saline injection) and higher vitamin D (HVD, after vitamin D injection). Muscle damage markers were measured at baseline and immediately after exercise.

Results: There were significant differences in muscle damage marker levels between the two trials (p<0.05) with no significant differences in muscle damage responses between the two trials (p>0.05).

Conclusion: Vitamin D replacement in vitamin D-deficient resistance-trained males may have key implications for the promotion of glucose metabolism and lowering the risk of diabetes in this population.

Board #280
May 30 9:00 AM - 10:30 AM

Effects Of Vitamin D And Resistance Training On Insulin Sensitivity And Neuromuscular Health In Obesity

Do-Houn Kim, Alex Klemp, Gloria Salazar, Hyun-Seok Hwang, Mingchua Yeh, Lynn B. Panton, FACSM, Jeong-Su Kim, FACSM. Florida State University, Tallahassee, FL.

Email: dkim5@fsu.edu

No relevant relationships reported

Vitamin D deficiency has been widely studied for its role in regulating calcium and bone metabolism. Increasing evidence shows that vitamin D has insulin-sensitizing and ergogenic properties, which are similar to the adaptations to resistance training (RT).

Purpose: To evaluate the effects of a 10-week vitamin D administration with or without RT on systemic insulin sensitivity, inflammation and neuromuscular health in p2C deficient mice, a genetic obese animal model with reduced insulin sensitivity.

Method: 24-week old p2C deficient male mice were assigned to the following groups (10/group) for 10-week interventions: control (p2C, no treatment), vitamin D (VD, 75 IU of vitamin D every 3 days), RT (ladder climbing 3x/wk), or combined treatment (VRT, VT+RT). Body weight and daily food intake were monitored biweekly. Body composition (Dual-energy X-ray absorptiometry), neuromuscular function (grip strength and sensorimotor function), and systemic glucose tolerance (2-hour oral glucose tolerance test) were measured pre- and post-intervention. Blood samples, the hindlimb muscles, and the spleen were collected post-intervention and analyzed for serum vitamin D levels, tissue wet weights, and myofiber cross-sectional area (CSA).

Results: 10-week vitamin D administration significantly increased serum vitamin D levels in USD (+61.1%) and VRT (+54.0%, p<0.001) compared to p2C. Total body mass significantly increased in three groups (p2C: +16.4%, VT: +13.5%, VRT: +8.6%, p<0.05) except RT. Fat mass increased significantly in p2C (+33.0%, p<0.005) but was not changed in the intervention groups. Lean mass was not affected by any intervention. Grip strength (+22.5%) and sensorimotor function (+12.8%) significantly decreased only in p2C (p<0.05). RT preserved fasting blood glucose levels (BG).

In addition, RT and VRT lowered 30-minute postprandial BG (RT: -40.9%, VRT:
Exercise science programs require rigorous academic preparation often taught in traditional classroom and lab settings. However, situated learning theory views learning as a process integrated in community, where the elements of social interaction, connectedness, and participation transform the understanding of meaningful knowing. Situated learning can have a complex effect on exercise science students’ connectedness, understanding, theory application, and professional skills. Additionally, social networks (like Facebook) can provide a modern educational community in which students can engage and connect in the classroom. PURPOSE: The purpose of this qualitative research was to examine the relationship between learning environment type (situated versus traditional) and the use of Facebook on undergraduate exercise science students’ perceived sense of overall classroom community, connectedness, and learning. METHODS: 69 undergraduate exercise science students (age [yrs] = 22.5 ± 2.1, males = 57.1%, females = 42.9%) who had participated in either a traditional course, traditional course with Facebook, a situated course, or a situated course with Facebook completed Rovai’s (2002) Classroom Community Survey at the end of their course experience. Multiple Regression was performed to determine if there were any significant differences between the four groups (α = .05). RESULTS: Results demonstrated a situated learning classroom and a situated learning classroom with Facebook were significant positive predictors of students’ perception of overall classroom community (R² = .181, F(3, 65) = 4.794, p < .004), connectedness (R² = .330, F(3, 65) = 3.232, p < .028), and learning (R² = .186, F(3, 65) = 4.965, p < .004). CONCLUSIONS: This research supports situated learning as a best practice for increasing classroom community in undergraduate exercise science programs. Students perceived higher levels of overall classroom community, connectedness, and learning when participating in a situated classroom and to an even greater extent a situated classroom with Facebook. Incorporation of these types of learning environments and teaching strategies in exercise science degree programs may enhance professional skill development and successful employment within the field.

Experiential learning pedagogies, including internship and service learning experiences, are becoming increasingly popular in higher education. An internship engages students with hands-on experiences that enhance their learning or into meaningful skills within their fields of study while service-learning is a type of experiential education in which students participate in service, typically within the community, and reflect on their involvement in such a way as to gain further understanding of course content and of the discipline as well as its relationship to societal needs. To date, no study has yet directly compared these teaching modalities. PURPOSE: To determine if a service learning experience or internship pose a more favorable effect on education-based self-efficacy. METHODS: The present study systematically evaluated a service learning experience against an internship experience using a mixed-methods model with the primary outcome being student self-efficacy. Sixteen students completed a community-based wellness internship with a subgroup (nine students) allocated to a service-learning component of internship which incorporated reflective assignments designed to improve self-efficacy. At the end of the semester, students completed a 15 item online self-efficacy and satisfaction survey using a Likert scale. Three focus groups were conducted in which 3-4 participants responded to a series of nine questions with which they were engaged in their internship. Qualitative data was analyzed thematically. RESULTS: Overall responses to the self-efficacy and satisfaction survey were favorable for both groups, but the internship group was more likely to agree or strongly agree with statements of self-efficacy. Focus groups found that the internship experience reinforced classroom learning, but the ability to work with different populations and ability to engage in the self-determination theory. Themes from reflective assignments, such as engaging with community members and professional exploration, were evident in the service-learning group responses only. CONCLUSION: When incorporating reflection assignments service learning experiences successfully connect the service experience to relevant course outcomes promoting student development and self-efficacy.
CPA included 2 items (alpha = .77): “I definitely plan to try using activity breaks in my classroom,” and “I expect I will be able to use activity breaks regularly.” Multiple linear regression was used to examine how the constructs of Competency, Autonomy, and Relatedness predicted intention to provide CPA to students.

RESULTS: Regression results indicated that the three predictors explained 44.1% of the variance (R² = .44, F(3,173) = 44.74, p < .001) in teacher intent to provide CPA. Competence (β = .31, t(173) = 4.92, p < .001), Autonomy (β = .19, t(173) = 3.15, p = .002) and Relatedness (β = .18, t(173)=3.40, p = .001) each significantly predicted intention.

CONCLUSION: Competence was the strongest predictor of teachers’ intent to provide CPA. However, feeling autonomous to implement CPA and viewing CPA as feasible are important in increasing teacher motivation to provide CPA.

3968 Board #285
May 30 8:00 AM - 9:30 AM
Effects Of Exercise On Plasma β-endorphin And Dsq In Methamphetamine Dependent Individuals
RUI XU, Biao Sun. Nanjing Sport Institute, NANJING, China. Email: ajiuweihu@126.com
(No relevant relationships reported)

PURPOSE: Methamphetamine is the main component of opioid drugs, which directly affects the central nervous system which leading to abnormal secretion of catecholamines. Physical exercise has been shown to benefit diverse medical and behavioral conditions. This study assesses the feasibility and efficacy of an 8-week aerobic and resistance training program on β-endorphin in plasma and desire for speed questionnaire (DSQ) for methamphetamine (MA) dependence.

METHODS: A total of 60 MA-dependent individuals were randomized to aerobic exercise group (AE, n=30) and resistance exercise group (RE, n=30). Each training group was trained over 8 weeks, 3 times/week, 90 minutes each time, which included formal training (70 minutes), warm-up (10 minutes) and recovery (10 minutes). The aerobic exercise intensity is 65%-85% HRmax and the muscle strength by 1-repetition maximum (1-RM) and endurance at 85% in resistant exercise group.

RESULTS: (1) After 8 weeks of exercise intervention, the β-endorphin levels in the group AE and group RE were significantly increased (p < 0.01). Inside, the level of β-endorphin in the group AE was increased from 154.7 ± 214.3 pg/ml to 181.7 ± 317.2 pg/ml, the rate of change of β-endorphin in plasma was 39.24%. The level of β-endorphin in the high-intensity group was increased from 158.4 ± 96.5 pg/ml to 181.7 ± 317.2 pg/ml, the rate of change was 14.76%. It is suggested that the effect of aerobic exercise on plasma β-endorphin is more effective than that of resistance exercise. (2) After 8 weeks of exercise intervention, MA-dependent have reduced their desires. The score of the DSQ in both groups were significantly decreased (p < 0.05). In the group AE the score was decreased from 105.4 ± 75.0 to 111.4 ± 77.7.

CONCLUSIONS: Both aerobic and resistance exercise can increase the level of β-endorphin in MA-dependent individuals, promote the formation of euphoria compensation mechanism, and reduce the desire for speed. The effect of aerobic exercise on plasma β-endorphin in methamphetamine dependent individuals was more obvious.

3969 Board #286
May 30 8:00 AM - 9:30 AM
Academic Burnout Amongst Exercise Science Students
Anne Borden, Haejin Dadachanji, Alyssa Fuller, Perla Flores, Mohammad Al-Hamed, Keith Naugle, Kelly Naugle. Indiana University - Purdue University Indianapolis, Indianapolis, IN. (Sponsor: Monica Hubal, FACSM)
(No relevant relationships reported)

PURPOSE: Prior research shows that the psychological constructs of hope, optimism, and self-efficacy impact voluntary behavior and quality of life. Academic burnout is prevalent among university students of all types. However, knowledge of what predicts burnout in undergraduate exercise science (ES) students is limited. Thus, the purpose of this longitudinal study was to examine the level of burnout at the beginning and end of the semester in ES students. Second, we examined the association of psychological factors and physical activity (PA) with burnout in ES students. METHODS: Students completed two online surveys within one Fall semester: one at the beginning of the semester and the other near the end. The first survey included the following questionnaires: Copenhagen Burnout Inventory, Adult Hope Scale, Life Orientation Test-Revised (optimism), Self-Efficacy to Regulate Exercise, Satisfaction with Life, and International Physical Activity Questionnaire (IPAQ). The second survey included the Copenhagen Burnout Inventory, IPAQ, and Satisfaction with Life. From the IPAQ, measures of moderate PA, vigorous PA, walking, and total PA were computed. Of the 169 participants, 59 were retained who completed both surveys and listed their major as ES.

RESULTS: At the beginning of the semester 35.6% of students reported high burnout and 22.8% reported high burnout near the end of the semester. Predictors of burnout were chosen based on significant correlations. Burnout at Time 1 negatively correlated with vigorous PA, optimism, and Life Satisfaction at Time 1. The regression revealed vigorous PA (β = -.232, p = .037), life satisfaction (β = -.303, p = .003), and optimism (β = -.369, p = .005) as predictors of burnout at Time 1. Burnout at Time 2 negatively correlated with CPA, optimism, life satisfaction, and hope at Time 1. Regressions showed life satisfaction (β = -.359, p < .008) and optimism (β = -.415, p = .002) at Time 1 as significant predictors of burnout at Time 2.

CONCLUSION: ES students reported higher burnout at the beginning of the semester compared to the semester. Higher levels of vigorous PA, optimism, and life satisfaction predicted lower burnout at the beginning of the semester. Greater optimism and life satisfaction at the beginning of the semester predicted lower burnout near the end of the semester.

3970 Board #287
May 30 8:00 AM - 9:30 AM
An Exercise-based Didactic Strategy In Physical Education Increases Motor Skills In Preschool Children: A Pilot Study
Iván Rentería, Ernesto Alonso González Castillo, Giovanna Arambula Barba, Concepción Danee Jáurez Hernández, Patricia Concepción Gárate Suárez, Alberto Jiménez Maldonado. Universidad Autónoma de Baja California, Ensenada, Baja California, Mexico. Email: irenteria@uabc.edu.mx
(No relevant relationships reported)

Physical education (PE) in preschool aims for the corporal and motor skills development in children, nevertheless the evaluation strategies of acquired skills has been neglected in Mexican preschool system. Since 2011 only PE teachers are responsible to teach classes, and a collaboration between public institutions allowed us to launch a pilot study of PE classes based on motor skills circuits called “motor action circuits” as an effective tool to develop motor skills. PURPOSE: To determine the effects of an exercise-based didactic strategy on the PE curricula on motor skills performance in children. METHODS: Five boys (Age = 5.2 ± 0.4 yr.) and nine girls (Age = 5.1 ± 0.3 yr.) participated in the study. Exclusion criteria for children were having a major pathology, pharmacological therapy, and enrollment in after-school physical activity programs. Children attended three 30-min lessons in non-consecutive days per week under the supervision of two trained female PE teachers. Motor skills were measured by the Movement Assessment Battery for Children (MABC-2) test. Two-way (2 genders x 2 measurements) mixedANOVA were computed for motor skills performance using the GraphPad Prism software. RESULTS: The assumption of normality was met by the Shapiro-Wilk test for girls (W = 0.849) and boys (W = 0.807). A better performance was found on threading beads (Pre = 1.7 ± 0.5 vs. Post = 1.1 ± 0.5 min, p = 0.004) and posting coins with the preferred hand (Pre = 26.5 ± 2.4 s vs. Post = 21.8 ± 5.0 s, p < 0.0001). A significant improvement was found on throwing at a wall using the right arm (Pre = 2.8 ± 0.1 vs. Post = 3.8 ± 0.2 hits, p = 0.002), the left arm (Pre = 2.4 ± 0.2 vs. Post = 3.8 ± 0.08 hits, p = 0.0001), throwing a bean bag into a box (Pre = 0.4 ± 0.2 vs. Post = 4.1 ± 1.2 hits, p = 0.0038), maintaining one-board balance with the preferred leg (Pre = 12.3 ± 8.4 vs. Post = 26.7 ± 7.7 s, p = 0.0007), and one-board balance with the other leg (Pre = 10.3 ± 5.9 s vs. Post = 23.6 ± 6.9 s, p = 0.0011). CONCLUSION: Significant motor skill performance improvements were observed in children attending an exercise-based didactic strategy on the PE program, which highlights the need to increase physical activity at early ages in Mexican children.
RESULTS: Scores for both sets of written examination scores were combined, resulting in an average score of 21.6±4.1 points out of 30 possible points, or 72.1%. The practical exam average equaled 13.6±1.3 points out of 15 possible points, or 90.4%. Accordingly, it was noted that scores for student performance on the practical exam were higher than those for the written examinations (p<0.05).

CONCLUSIONS: While pedagogical approaches differ for theoretical and practical instruction due to the nature and need for specific instruction in an undergraduate exercise physiology laboratory course, it appears that additional skills practice opportunities may result in higher test scores and improved learning, as reflected by practical examination. Thus, adequate skills practice opportunities, in conjunction with traditional didactic instruction, are recommended to enhance student learning and competence in laboratory content.

G-44 Free Communication/Poster - Genetics, Immunology and Endocrinology in Athletes
Saturday, May 30, 2020, 8:00 AM - 10:30 AM
Room: CC-Exhibit Hall

Association Between Muscle Stiffness And Esr1 Rs2234693, Rs9340799 And Actn3 R577x Polymorphisms In Collegiate Athletes
Hiroki Homma, Mika Saito, Naoki Kikuchi. Nippon Sport Science University, Tokyo, Japan.

Previous studies have reported that distinct gene polymorphisms (e.g. ACTN3 R577X, Esr1 Rs2234693, Rs9340799) are associated with muscle stiffness, amongst which Esr1 rs2234693 and rs9340799 polymorphisms are also associated with instances of muscle injury. PURPOSE: To investigate the association between muscle stiffness and Esr1 rs2234693, rs9340799 and ACTN3 R577x polymorphisms in collegiate athletes. METHODS: In this study, 40 athletes (33 men and 7 women), who had undergone resistance training, were evaluated for the occurrence of muscle stiffness (hamstrings: biceps femoris, semitendinosus, and semimembranosus) by ultrasound shear wave elastography. Additionally, Esr1 rs2234693, rs9340799 and ACTN3 R577x polymorphisms were analyzed using the TaqMan SNP Genotyping Assay. Comparisons of muscle stiffness between the genotypes were performed using one-way ANOVA. The Hardy-Weinberg equilibrium was determined for the Esr1 rs2234693, rs9340799 and ACTN3 R577x polymorphisms in collegiate athletes. RESULTS: The genotypes frequencies of the Esr1 rs2234693 (CC 13%, CT 55%, TT 33%), rs9340799 (GG 3%, GA 25%, AA 73%) and ACTN3 R577x polymorphisms were consistent with the Hardy-Weinberg equilibrium (p=0.36, p=0.90, p=0.08, respectively). However, there was no significant difference in muscle stiffness between Esr1 rs2234693 and ACTN3 R577x genotypes. Further, the G or GA genotype of Esr1 rs9340799 polymorphism did not exhibit a greater muscle stiffness of the hamstring muscles compared with the AA genotype in collegiate athletes (27.2 ± 7.0kPa vs 22.4 ± 6.7kPa, p=0.054). CONCLUSIONS: Our results suggested that Esr1 rs2234693, rs9340799 and ACTN3 R577x polymorphisms are not associated with muscle stiffness in collegiate athletes.

3972 Board #289 May 30 9:00 AM - 10:30 AM
Self-reported Stress And Well-being Impacts Immune Response To Maximal Exercise In Collegiate Swimmers
Bailey M. Theall1, Haoyang Wang2, Connor Kuremsky1, Eunhan Choi1, Katelyn Hardin1, Lyle Roblot1, Jack Marucci2, Shelly Mulleniex1, Nathan Lemoine, Jr.2, Brian A. Irving, FACSM1, Nathan Lemoine, Jr.2, Brian A. Irving, FACSM1.

Purpose: Exposure to acute psychological and physiological stressors is associated with impairments in immune function including reduced exercise-induced mobilization of naïve (NA) T-cells and increased mobilization of antigen-specific, highly differentiated T-cells following maximal exercise. However, the impact of sustained stressors on the immune response to maximal exercise is unknown. PURPOSE: Characterize the impact of self-reported stress and well-being on lymphocyte responses to acute bouts of exercise in collegiate swimmers over six months. Methods: Blood samples were collected from fifteen NCAA D1 swimmers (7 M, 6 F; 19.8 ± 0.7 y) before and after maximal swim tests at two timepoints (V1; immediately post-season 1 and V2; early season 2). An additional mid-off season timepoint (V3) was collected in a subset of nine swimmers. T-cells were quantified by flow cytometry, and self-reported measures of sleep quality (PSQI), symptoms of upper respiratory tract infection (URT, WURRS-21), and overtraining (DALDA) were collected. Linear mixed models were used to determine the effects of exercise, season timepoint, and their interaction on lymphocyte percentages (p<0.05). Pearson’s correlation coefficients were used to assess correlations between lymphocyte percentages and stress measures. Results: Lower sleep quality was correlated with greater resting and post-exercise senescent CD4+ T-cell percentages (p=0.44, p=0.01; p=0.47, p=0.004, respectively). Lower sleep quality was also correlated with lower post-exercise NA CD4+ T-cells (r=−0.35, p=0.04). Higher ratings of self-reported symptoms of URT (r=0.38, p=0.02) and overtraining (r=0.38, p=0.02) were correlated with greater post-exercise senescent CD4+ T-cell percentages. Compared to pre-exercise, post-exercise NA CD4+ T-cell percentages were lower at V1, and CD8+ T-cell percentages were higher post-exercise (p<0.01). Conclusions: Our results suggest that rest adversely impacted immune response to maximal exercise in collegiate swimmers. Impaired sleep quality and higher URT and overtraining symptoms were associated with an exacerbated exercise-induced mobilization of senescent CD8+ T-cells, highlighting the importance of monitoring athlete stress level and overall well-being throughout the competitive season.

3973 Board #290 May 30 9:00 AM - 10:30 AM
Acute And Chronic Brain-Derived Neurotrophic Factor Responses During One Season Training In Young Swimmers
Dimmitra NAPAKITIOTI1, Anastassios PHILLIPOU1, GEORGE VAGIKAOKAS1, NIKOS VAGIKAOKAS1, MARKOS MANTALOUSA1, George CHROSOUS1, Michael KOUTSILERIS1, Theodoros PLATANOU1, N. NATIONAL AND KAPODISTRIAN UNIVERSITY OF ATHENS, ATHENS, Greece. 2NATIONAL TECHNICAL UNIVERSITY OF ATHENS, ATHENS, Greece.

PURPOSE: To the authors’ best knowledge this is the first study examining the acute and chronic BDNF responses during one season training in young athletes. These findings indicate that long-term swimming training can affect the resting and acute (pre-post testing) circulating BDNF in young swimmers.

3974 Board #291 May 30 9:00 AM - 10:30 AM
Acute And Chronic Brain-Derived Neurotrophic Factor Responses During One Season Training In Young Swimmers
Dimmitra NAPAKITIOTI1, Anastassios PHILLIPOU1, GEORGE VAGIKAOKAS1, NIKOS VAGIKAOKAS1, MARKOS MANTALOUSA1, George CHROSOUS1, Michael KOUTSILERIS1, Theodoros PLATANOU1, N. NATIONAL AND KAPODISTRIAN UNIVERSITY OF ATHENS, ATHENS, Greece. 2NATIONAL TECHNICAL UNIVERSITY OF ATHENS, ATHENS, Greece.

CONCLUSIONS: It has been demonstrated that Brain-Derived Neurotrophic Factor (BDNF) is a mediator of neuroprotective and neuroplastic processes, and that BDNF is representative of central concentrations as well. Interestingly, there is evidence that BDNF levels are elevated in response to exercise.

RESULTS: This study aimed at investigating the acute and chronic effects of a full season swimming training on serum BDNF, both at rest and after a maximal exercise bout in young athletes. METHODS: Twelve well-trained male swimmers (14.08±1.0 yrs) participated in the study. Measurements were carried out at the beginning of the training season (T1) as well as pre- and post- taper of each of the two competitive periods (i.e., T2, T3 for the first macrocycle, and T4, T5 for the second macrocycle, respectively). At each of the above time points, blood samples were collected pre- and 1 hour post a maximal, 400m swimming testing. Serum BDNF levels were measured by ELISA. Adjustment for exercise-induced plasma volume changes was performed before data analysis. Two-way ANOVA with repeated measures was used for statistics.

RESULTS: A significant pre-post testing difference was observed at T2 (p=0.048). In addition, a main effect of time was found among the 5 time points (T1-T5; p<0.000). Moreover, both pre- and post- testing responses had a similar profile exhibiting a decline from T1 to T3 (pre: 23,412±2,504 pg/ml vs 3,433±669 pg/ml, post: 23,004±3,410 pg/ml vs 2,743±550 pg/ml) and from T4 to T5 (pre: 19,428±1,097 pg/ml vs 11,993±969 pg/ml, post: 22,111±1,455 pg/ml vs 12,831±1,763 pg/ml), and an increase from T3 to T4 (pre: 3,433±669 pg/ml vs 19,428±1,097 pg/ml, post: 2,743±550 pg/ml vs 22,111±1,455 pg/ml).

CONCLUSIONS: To the authors’ best-knowledge this is the first study examining the acute and chronic BDNF responses during one season training in young athletes. These findings indicate that long-term swimming training can affect the resting and acute (pre-post testing) circulating BDNF in young swimmers.

3975 Board #292 May 30 9:00 AM - 10:30 AM
Hormonal And Heart Rate Changes To Maximal Exercise In Elite Adolescent Athletes
Gábor Almási1, Edith Bosnyák1, Ákos Móra2, Annamária Zsákai3, Piroska Fehér3, Dorina Annár3, Miklós Tóth1, George V Agiaakos2, Nikos V Agiaakos1, Gábor Almási1, Edit Bosnyák1, Ákos Móra2, Annamária Zsákai3, Piroska Fehér3, Dorina Annár3, Miklós Tóth1, George V Agiaakos2, Nikos V Agiaakos1.

Acute and chronic hormone level changes and acute training’s influence on the stress level in adolescent athletes. OBJECTIVES: To determine the relationship between a maximal swimming exercise and hormone level changes and acute training’s influence on the stress level in elite adolescent athletes. METHODS: The study was conducted with 31 participants (boys: n=19, mean age±SD: 16.34±1.12 years; girls n=12, 15.17±0.81 years) from the

Abstracts were prepared by the authors and printed as submitted.
It is documented that intense periods of soccer can induce oxidative stress, the negative effects of which can have a negative impact on performance. However, few studies have explored the potential association between exercise-induced oxidative stress and training load intensity. PURPOSE: The aim of the study was to quantify oxidative stress relative to indicators of high-intensity training load in a cohort of professional soccer players.

METHODS: Twelve moderately trained males (age: 28 ± 5.1 years) participated in this randomized cross-over study. After a graded exercise test the protocol comprised two visits including four exhaustive runs on a treadmill starting every 60 min with inclines being raised every 4 min. During the rest period of 20 min, participants rested passively or CT was applied using pants with an integrated cooling system (Aquilo Sports GmbH, Switzerland). Heart rate (HR) was measured continuously and venous blood samples were taken before, immediately, 30 min, 1 h, 3 h, and 24 h after terminating the final run. The following parameters were analyzed: blood glucose (GLU), creatinine kinase (CK), lactate dehydrogenase (LDH), total white blood cells (WBC), lymphocytes (LYM), granulocytes (GRA), interleukin 6 (IL-6), blood lactate concentration (Lac). RESULTS: Significant longer running times were found in the final run when using CT compared to passive rest (r = 5.8%, p = 0.036). GLU was significantly higher immediately after the final run and IL-6 was significantly higher 60 min after terminating the final run in CT (GLU: 362.5%, p = 0.006, IL-6: 462.2%, p = 0.048). WBC and GRA were significantly higher in CT 180 min after the final run (WBC: r = 1.4%, p = 0.028, GRA: r = 13.7%, p = 0.010). No significant differences were found between recovery methods in HR, maximum La, LYM and LYM (all at p < 0.050). CONCLUSIONS: Application of CT significantly elevated the resistance to fatigue of the participants. There is no evidence that this is due to reduced muscle damage as there has not been an effect in CK. According to the elevation of immune cells a higher activation of the immune system is suggested which in turn is counteracting to the frequently observed immune suppression after exhaustive exercise. Increased IL-6 levels can likely be explained by the increase of GRA. This study identified that there is a trend towards a positive effect of CT on the immune system.

CONCLUSIONS: Chronic soccer training appears to promote an adaptive response as oxidative stress was attenuated over the competitive season, irrespective of the intensity of the training load. Monitoring urinary MDA may be a useful tool to provide coaches and sports scientists an insight into adaptive or maladaptive responses throughout a competitive season in soccer.

MUSCLE damage and changes in immune cell numbers are induced by intensive repetitive and long-term physical stress leading to fatigue and decreased performance. It is widely suggested that cryotherapy (CT) is an effective strategy for accelerated recovery. PURPOSE: Assessing the influence of CT compared to passive recovery on blood biomarkers after repetitive and exhausting aerobic running exercise.

METHODS: Eleven male football players aged between 18–22 years, with at least 2 years of football history and regularly trained were included in the study. VO2max values of the athletes were calculated with 20 Meter Shuttle Test. The participants were randomly allocated to two groups. Half of the participants were exercised on the antigravity treadmill and the other half on a treadmill with normal incline.
treadmill and half of them were exercised on the normal treadmill for 45 minutes on %70 of VO2max values. After a week participants were exercised vice versa. IL-8, TNF-α and CRP levels were analyzed before, immediately after, 30 minutes and 2 hours after the exercises. **RESULTS:** CRP levels did not change with time in the antigravity and normal treadmill exercise and it was not different between the both groups (P > 0.05). TNF-α levels were lower 30 minutes after the exercise than the immediately after the exercise in the normal treadmill exercise (P = 0.05). However, it did not change time in the antigravity treadmill exercise and was not different between the both groups (P > 0.05). IL-8 levels were higher 2 hours after the exercise than the before and immediately after the exercise in the antigravity treadmill exercise (P < 0.05). However, it did not change with time in the normal treadmill exercise and was not different between the both groups (P > 0.05).

**CONCLUSIONS:** Antigravity treadmill exercise differently affects inflammatory processes than the normal treadmill exercise.

### 3980 Board #297 30 May 9:00 AM - 10:30 AM Differential Responses Of Resting Vs. Post-exertion Hormone Concentrations During Simulated Military Operational Stress


(No relevant relationships reported)

Military operational stress has been shown to impair performance and cause changes in corresponding blood biomarkers. Anabolic and stress hormones are common biomarkers used as surrogate endpoints to monitor physiological status during military training. **PURPOSE:** To determine patterns of resting and exercise-induced anabolic and stress hormones across 5 days of simulated military operational stress (SMOS). **METHODS:** 51 service members (25.8±5.1 yrs, 174.5±9.4 cm, 80.1±15.9 kg, 21.4±7.0 BF%; 11 women) completed a 5-day/night SMOS protocol. During days 3 (D3) and 4 (D4), subjects were given 50% of caloric demands. On nights 1, 2, and 5 subjects slept from 2300-0700. During nights 3 and 4, subjects slept from 0100-0300 and 0500-0700. Participants underwent a Tactical Mobility Test (TMT) familiarization on D1 followed by testing on D2: 5-2 min walk can carry (40 kg), fire and movement course, 20-meter casualty drag (91 kg), 300-meter unloaded and loaded (16 kg) shuttle runs, and 2-mile paced then 2-mile best effort timed ruck march (15 kg). Blood was drawn before (PRE) and immediately after (POST) the TMT. A two-way repeated measures ANOVA was run to determine the effect of exercise over time on growth hormone (GH), insulin-like growth factor-I (IGF-I), adrenocorticotropic hormone (ACTH), and cortisol concentrations. **RESULTS:** There were no significant interactions between exercise and time on hormone concentrations. However, there was a significant main effect of time on IGF-I (D2: 40.2±2.0 to D4: 37.3±2.0 to D5: 35.2±1.9 ng/mL, p<0.001) and cortisol (D2: 22.3±1.0 and D5: 19.6±1.2 μg/dL, p=0.02). Exercise caused a significant increase in IGF-I (PRE: 37.2±2.0 vs. POST: 40.2±1.9 ng/mL, p<0.001), GH (PRE: 1.2±0.3 vs. POST: 3.9±0.6 ng/mL, p<0.001), ACTH (PRE: 49.8±11.1 vs. 61.1±11.5 pg/mL, p=0.001), and cortisol (PRE: 15.8±0.8 vs. POST: 25.8±1.5 μg/dL, p<0.001). **CONCLUSION:** Despite significant declines in circulating hormone concentrations over time during SMOS, hormonal response amplitude was maintained. Hormonal response to exertion may provide important insights to physiological status that would otherwise be missed if measuring circulating concentrations alone.

### 3981 Board #298 30 May 9:00 AM - 10:30 AM Rapid Gut Microbiome Changes In A World-Class Ultramarathon Runner: A Case Study

Gregory J. Grosicki, Ryan P. Durc, James R. Bagley. ’Georgia Southern University (Armstrong Campus), Savannah, GA. ’San Francisco State University, San Francisco, CA.

Email: ggrosicki@georgiasouthern.edu

(No relevant relationships reported)

The human gut microbiome is a dynamic ecosystem with prolific health connotations. Physical activity is emerging as a potent regulator of human microbiome composition. **PURPOSE:** This study examined changes in the gut microbiome of a world-class ultramarathon runner before and after competing in the Western States Endurance Run (WSER), a 163 km mountain footrace. **METHODS:** Anthropometrics and body composition were assessed and the ultra-marathoner’s submaximal and maximal performance profiles were evaluated. Gut microbiome analyses were performed at four time-points: 21 wk and 2 wk before and 2 and 10 d after WSER. **RESULTS:** Aerobic power (VO2max) was 4.24 ± 0.11 (66.7 ± 1.83 kg/min), and running economy (51.1 ± 3.28 m/min) and lactate threshold (~83% VO2max) values were comparable to that of highly trained distance runners. Two hours post-race, considerable changes in the ultramarathoner gut microbiome were observed. Alpha diversity (Shannon Diversity Index) increased from 2.73 to 2.80 and phylogen-level bacterial composition (Firmicutes/Bacteroidetes ratio) rose from 4.4 to 14.2. Underlying these macro-level microbial alterations were demonstrable increases in select bacterial genera such as Veillonella (+41%), Butyrivibrio (+70%), and Streptococcus (+438%) concomitant with reductions in Alloprevotella (-79%) and Subdoligranulum (-50%). **CONCLUSIONS:** To our knowledge, this case study shows the most rapid and pronounced shifts in human gut microbiome composition after acute exercise in the human literature. These findings provide yet another example of how exercise can be a powerful modulator of human health.

The use of probiotics is recommended for maintaining the immunological health of endurance athletes, however the effects of probiotics on athletes immune cells function is still unclear. **PURPOSE:** Investigate the effect of probiotics utilization in phagocytic function of neutrophils from marathon runners

**METHODS:** Twenty seven male marathoners were double-blind randomly assigned to either a probiotic group (PR) [L=6, 35.9±8.1 years, 79.3±10.9 kg, time of trial, 4:08 hours ± 22:55 minutes] or placebo (PL) [PL=13:40.46 ± 7.79 years, 72.67 ± 10.20 kg, time of trial, 4:53 hours ± 1:15 minutes]. PR consumed during 30 days a sachet containing Lactobacillus Acidophilus and Bifidobacterium Lactis (10x10^9 CFU and maltodextrin 5g/day) while PL received a sachet with maltodextrin (5g/day).

Phagocytic function of neutrophils was assessed by specific phagocytosis kit (Vybrant /Thermo Fisher®) after blood cell neutrophil isolation. The measures were evaluated before the supplementation period (B), one day before the race (1D), and one hour after race (1H). Data were analyzed in SPSS version 25® using ANOVA two way with repeated measures, “group” and “time” as factors, and Tukey’s post-hoc test (p<0.05).

**RESULTS:** The statistical analyses showed significant differences among the times. The PL group showed significant decrease of phagocytic function when compared with both other times (B: 32.46±14.47; 1D:10±14.3±0.8; 1H:15±14.65) and the same behavior was seen in the probiotic group with a significant decrease of phagocytic function when compared with the basal with other times (B:25.96±10.21; 1D:8.59±4.33; 1H:8.07±2.29). Between groups no differences was observed.

**CONCLUSIONS:** Thirty days of probiotic (Lactobacillus Acidophilus and Bifidobacterium Lactis (10x10^10 CFU/day) supplementation was not able to cause alterations in neutrophil phagocytic function. These results may change regarding other immune cells population and with prolonged use or higher dosages of probiotic.

Clinical Exercise Physiology - Other

**G-45 Free Communication/Poster - Clinical Exercise Physiology - Other**

Saturday, May 30, 2020, 8:00 AM - 10:30 AM

**Room:** CC-Exhibit Hall

**3983 Board #300 May 30 8:00 AM - 9:30 AM Evaluating The Validity Of Heart Rate Measured By The Rhythm During Mountain Biking**

Peyton Cater, Jacquelyn L.V. Sertic, Bryson Carrier, Brenna Barrios, Robert W. Salatto, James W. Valalta, FACS/M. UNLV, LAS VEGAS, NV. (Sponsor: James Valalta, FACS/M)

Email: caterp1@unlv.nevada.edu

(No relevant relationships reported)

The Rhythm armband is a wearable device that measures heart rate, and it is unknown whether it is valid throughout rough terrain, such as mountain biking. **PURPOSE:** The purpose of this study was to investigate the validity of heart rate (HR) measurement by the Rhythm armband against the criterion, the Polar H7 chest strap while mountain biking.

**METHODS:** A total of sixteen healthy adults (males = 8, females = 8, 24.69 ± 4.44 yrs, 171.45 ± 8.9 cm, 74.23 ± 21.07 kg) were recruited to ride mountain bikes on a 3.22km, beginner-level mountain biking trail at the McCullough Hills Trailhead in Henderson, NV. Participants were fitted with both a Polar H7 heart rate monitor and the Rhythm HR monitor and rode 1.61km away from the trailhead and 1.61km back to the start of the trailhead.

Abstracts were prepared by the authors and printed as submitted.
Heart, kidney and liver transplanted patients (HTR, KTR and LTR) suffer from a reduced exercise capacity. Several studies pointed out the impairments of both central and peripheral factors as responsible for the decreased peak oxygen consumption (V'O2peak) and diminished peak work rate (WR peak); however, if the main limitation comes from central factors as peripheral origin is still unclear (Williams and McKenna, 2012). In healthy humans, V'O2peak is mainly constrained by central factors with peripheral factors playing a minor role, indeed endurance training (ET) involving small muscle mass fails to increase whole-body V'O2peak (Rud et al, 2012). Given the skeletal muscle factors playing a minor role, indeed endurance training (ET) involving small muscle mass, e.g. single leg cycling (SL), induces higher increase in V'O2peak that engaging in physical activity (PA) improves glomerular filtration rate (GFR), body composition and functional capacity. The results from the IPAQ-L showed that the participants engaged in moderate physical activity and remain sitting for long periods of time, obese and with lower functional capacity.

PURPOSE: Understand the conditions surrounding rhabdomyolysis in extreme conditioning programs such as CrossFit to prevent new cases.

METHODS: Blood tests, abdomen ultrasound and urine summary of a 36-year-old Crossfit athlete (5’9” and 154 pounds) were analyzed after suffering an injury during the world competition of Crossfit (Reebok CrossFit Games, 2018).

RESULTS: On the same day of the injury it was already possible to notice great abdominal distension and the creatine kinase (CK) values were 42,040 U/L, and after 72 hours it reached 82,443 U/L. After 6 days, abdominal ultrasound was performed identifying areas of hemorrhage and rupture in the rectus abdominis, bilaterally and throughout. After 8 days, blood tests showed elevated values of enzymes other than CK, such as oxalacetic glutamic transaminase (TGO) and pyruvic glutamic transaminase (TGP): 456 U/L (reference value 5 to 40 U/L) and 513 U/L (reference value 10 to 49 U/L) respectively. In addition, elevations in lactate dehydrogenase (555 U/L; reference value: 120 to 246 U/L), and again CK (18,962 U/L) were also seen. The urine summary showed an increase in red blood cell levels and the presence of hemoglobin. After 15 days the examinations were repeated and TGO levels decreased by 92.6% (29 U/L; reference value 10 to 49 U/L) and TGP 72.7% (140 U/L; reference value 10 to 49 U/L). Lactate dehydrogenase decreased to 157 U/L and CK to 284 U/L (99.6% reduction).

CONCLUSIONS: Thus, it is possible to conclude that an athlete’s susceptibility to rhabdomyolysis is real, especially when in conditions that are determinant for it, such as sports competitions, heat, dehydration and other factors. Early diagnosis that requires clinical suspicion associated with laboratory confirmation is important in order to avoid further damage to the athlete, as well as to prevent future cases.

ACSM May 26 – May 30, 2020 San Francisco, California
Fatigability is not well understood in this population.

Purpose: The aim of the study was to compare the longer-term reliability (over 9 weeks and 15 weeks) of an isotonic muscle power test.

Methods: Subjects were 13 women (age 44±9 years, BMI 29.8±5.7 kg/m2) enrolled in the NIH Aerobic Exercise in Women with Systemic Lupus Erythematosus index (SELENA-SLEDAI, score <4), and self-reported cardiorespiratory limitations in women with SLE, its influence on fatigue and persistent and excessive fatigue is the most common and debilitating feature of SLE, and results in significant fatigability. Subjects also completed treadmill cardiopulmonary exercise tests (CPET) to volitional exhaustion, 10-minute walk tests (10MWT), and the Patient-Reported Outcomes Measurement Information System (PROMIS) and Fatigue Severity Scale (FSS) questionnaires, before and after the 12 weeks of training.

RESULTS: Subjects attended an average of 34 (±2) supervised training sessions. Improvements in measures of performance fatigability and perceived fatigue in women with SLE after 12 weeks of aerobic exercise training.

CONCLUSIONS: These results suggest that aerobic exercise training improved both performance fatigability and perceived fatigue in these women with SLE.

Validity Of Body Composition Measures By Inbody 770 Bioelectrical Impedance Analyzer

Naama W. Constantini, FACSFM,1 Ori Fridlich2, Ziv Dadon1, Shachar Nise3, Eilon Shcolnik,1 Dana Deeb1, Keren Constantini, Ruth Shemer,1 Benjamin Glaser,4 Yuval Dor.1 1Shaare-Zedek Medical Center affiliated with the Hebrew University School of Medicine, Jerusalem, Israel. 2The Hebrew University-Hadassah Medical School, Jerusalem, Israel. 3Tel Aviv University, Tel-Aviv, Israel. 4Hadassah-Hebrew University Medical Center, Jerusalem, Israel.

Email: naamacons@gmail.com

No relevant relationships reported

Purpose: To test the validity of InBody 770 bioimpedance analyzer (IB770) against isotopic dilution (D2O) for total body water (TBW) and against DXA for percent body fat (PBF). Methods: Fifty-eight apparently healthy women (mean age 21.2 ±2.6 years, BMI 26.7 ±6.3) visited the Exercise Science Physiology Laboratory at KSU after an overnight fast. Subjects were given a 10g deuterium oxide solution (Cambridge Laboratories) to drink within 5 minutes and were asked to remain still in a reclining chair for 4 hours before providing a urine sample. Subjects were assessed via DXA for PBF and IB770 for both TBW and PBF. Frozen urine samples were shipped to an external laboratory for TBW assessment by mass spectroscopy. Results: TBW estimates from IB770 were similar to those from D2O (32.6 ±5.9 vs. 32.3 ±6.0, respectively). PBF estimates from IB770 were also consistent with those from DXA (35.1 ±9.1 vs. 35.8 ±6.5, respectively). T-tests indicated that there were no significant differences among these measures (p=0.05 for both). IB770 measures for TBW and PBF were strongly correlated with D2O (r=0.961, p<0.001) and DXA (r=0.961, p=0.001), respectively. CONCLUSIONS: These data suggest that IB770 is a valid method for estimating TBW and PBF and may be appropriate for use as an alternative to D2O and DXA in a young female population.

Effect Of Various Types Of Exercise On Cell-free Circulating DNA

Naama W. Constantini, FACSFM,1 Ori Fridlich,2 Ziv Dadon1, Shachar Nise3, Eilon Shcolnik,1 Dana Deeb,1 Keren Constantini, Ruth Shemer,1 Benjamin Glaser,4 Yuval Dor.1 1Shaare-Zedek Medical Center affiliated with the Hebrew University School of Medicine, Jerusalem, Israel. 2The Hebrew University-Hadassah Medical School, Jerusalem, Israel. 3Tel Aviv University, Tel-Aviv, Israel. 4Hadassah-Hebrew University Medical Center, Jerusalem, Israel.

Email: naamacons@gmail.com

No relevant relationships reported

Elevated levels of cell-free circulating DNA fragments (cfDNA) released from dying cells into the blood stream have been established as a reliable biomarker in multiple pathologies such as trauma, heart attack, cancer and inflammation. Acute exercise causes an immediate increase in the concentration of cfDNA in the blood. The cellular origins and the physiological significance of this phenomenon are not understood, but it has been speculated that cfDNA in exercise may reflect the intensity of the effort and potentially indicate overtraining.

Purpose: The aim of the study was to compare the level of cfDNA after different types of exercise, and to identify their source.

Methods: We have used a methylation-based approach to assess the tissue sources of blood cfDNA of 75 subjects, men and women, ages 17-46 years, before and after the following exercise activities: Graded maximal exercise test (8-12 min; n=16), 40 minutes moderate-intensity run (n=12) half marathon (21.1km; n=15), marathon (42.2 km; n=14), cycling time trial (32 km; n=15) and open water swimming (10 km; n=19).

Results: Our analysis revealed a significant (P<0.0005) elevation of cfDNA after strenuous exercise which varied between sport modalities (Figure). cfDNA levels returned to near-baseline within 60 minutes post exercise, and derived exclusively from neutrophils and not from myocytes or other tissues. Conclusions: The origin of...
the blood cDNA in response to physical activity stems exclusively from neutrophils, with a large difference in its amount following various types of exercise. We are currently attempting to understand the physiological mechanisms of this exercise induced elevated cDNA, including heart rate, blood pressure, type of muscle activity, blood oxygen levels, body temperature etc. Our findings open an exciting window into inflammatory and other physiologic processes taking place during exercise, and shed light on new aspects of cdNA biology.

S866 Vol. 52 No. 5 Supplement

3992 Board #309 May 30 8:00 AM - 9:30 AM Effects Of High-Intensity Interval Training On The Expression Of Circulating Micro-RNAs In Women With Polycystic Ovary Syndrome

Sofie Lionetto, Ida A. Kiell, Donny M. Camara, Eszter Vanky, Evelyn B. Parr, John A. Hawley, Trine Moholdt, 1Norwegian University of Science and Technology, Trondheim, Norway. 2Swinburne University of Technology, Melbourne, Australia. 3St. Olav’s Hospital, Trondheim, Norway. 4Australian Catholic University, Melbourne, Australia. Email: Sofie.b.lionetto@ntnu.no

Purpose: To compare the expression of circulating miRNAs (c-miRNAs) in women with and without Polycystic Ovary Syndrome (PCOS), and 2) to determine the effects of two different high intensity training (HIT) protocols in women with PCOS on c-miRNA expression. Methods: Women with PCOS were randomised to one of three conditions: 1) HIT (n=12; 30 ± 6 years; BMI, 29.3 ± 5.5 kg/m2; VO2peak, 34.9 ± 6.7 mL/kg/min). Women without PCOS were age- and BMI-matched to 12 women with PCOS. The array contained 8 c-miRNAs previously reported to associate with PCOS and/or training. Results: Compared to Non-PCOS (n=15), 45 ± 52%). miRNA-27b is associated with hormone metabolism, and is positively correlated with testosterone. No observed difference was observed between HIT1 and HIT4 compared to Non-Ex after the training (P=0.043, 156 ± 105% and P=0.040, 184 ± 100%, respectively). Conclusion: Frequent interruptions in SB had no effect on PPG, prior to or after a 2-week detraining period, when compared to prolonged SB in active older adults. On the contrary, older adults experiencing a short-term detraining period can use strategies, such as breaking up SB, in order to potentially improve glycemic control during these intermissions.

3993 Board #310 May 30 8:00 AM - 9:30 AM Exercise Snacking And Detraining Effects On Postprandial Glucose Responses - A Randomized Crossover Trial In Trained Older Adults


Purpose: Experimental data suggest that frequent interruptions in sedentary behavior (SB) promote improvements in postprandial glucose (PPG) responses. However, little is known about the impact of these interruptions before and after a detraining period in active older adults. The main purpose of this investigation was to examine the acute effects of interrupting prolonged SB in a sample of trained older adults, before and after 2-weeks of detraining, on PPG. Methods: Older active adults performing structured exercise at least 2/week for the past 6 months (n=14; aged between 65 and 90 years-old), were enrolled in a randomized crossover trial. Participants performed two conditions before and after 2-weeks of detraining (i.e. refrain from structured exercise): 1) uninterrupted sitting, where participants remained seated throughout 7 hours (SIT); 2) Sitting + moderate intensity breaks (INT), where participants were instructed to sit for 7 hours, while interrupting this behavior with 2 minutes of moderate-intensity physical activity (PA) every 30 minutes. The primary outcome was changes in PPG, while body composition and cardiorespiratory fitness (CRF) were considered secondary outcomes. Generalized estimating equations (GEE) were used. Summary of Results: Both at baseline and after detraining, no differences were observed for 7-h total area under the curve (7h-AUC) for glucose (baseline: ∆ 3.1%, p = 0.523; post-detraining: ∆ 10.3%, p = 0.015) and insulin (baseline: ∆ 33.8%, p = 0.541; post-detraining: ∆ -9.0%, p = 0.088) between INT and SIT experimental conditions. An unfavorable effect was observed for the SIT condition from baseline to after the detraining period, with higher values for 7h-AUC (Δ 10.6%, p = 0.014) and MG (Δ 11.7%, p = 0.015). No changes were observed in the response to INT condition between baseline and after detraining in PPG values (7h-AUC: ∆ 4.4%, p = 0.515; MG: ∆ 5.2%, p = 0.523). Conclusion: Frequent interruptions in SB had no effect on PPG, prior to or after a 2-week detraining period, when compared to prolonged SB in active older adults. On the contrary, older adults experiencing a short-term detraining period can use strategies, such as breaking up SB, in order to potentially improve glycemic control during these intermissions.

3994 Board #311 May 30 8:00 AM - 9:30 AM Step Count Error Of Activity Monitors For Patients In Phase II Cardiac Rehabilitation

Lindsay Toth1, Scott Crouter, FACSMS, Cary Springer1, David Bassett, Jr., FACSMS. 1University of North Florida, Jacksonville, FL. 2The University of Tennessee, Knoxville, TN. (Sponsor: David Bassett, Jr, FACSMS)

The use of wearable activity monitors in patient populations is gaining popularity with researchers and clinicians. Because much of the research describing their accuracy has been completed with healthy participants, investigating the error in daily steps in patient populations, the most intuitive physical activity metric, is necessary. Purpose: To investigate the step count error of four wearable activity monitors compared to StepWatch (SW) steps across the day for days when patients attended phase II cardiac rehabilitation (CR) and days when they did not attend. Methods: Nineteen phase II CR patients (mean ± SD; age, 68 ± 7 yr; BMI, 31.7 ± 14.7 kg/m2) wore an SW (criterion step method) on the ankle for four days. For comparison, one wrist-worn monitor (Fitbit Charge 2 [Charge] or Apple Watch series 2 [Apple]) and one waist-worn monitor (Fitbit Zip or ActiGraph GT9X [AG]) were randomly assigned, per participant, for wear during the first two days and the other wrist and waist monitors were worn during the second two days. Each monitor was worn for one day where patients attended CR (ACR) and for one day they did not attend (NCR). AG steps were processed with and without the low-frequency extension (AUXL and AG, respectively) and with the moving average vector magnitude algorithm. Daily steps for each monitor were summed across self-reported wear time and converted to percent of SW steps. One sample t-tests were used to determine if the percent of SW steps from each monitor, for each condition, was significantly different from 100% of SW steps and paired samples t-tests were used to compare the ACR and NCR conditions, per monitor. Results: Summary statistics showing the degree of error for each monitor are available in Table 1. Conclusion: For those in phase II CR, steps are underestimated during ACR and NCR days, except when the LFE is applied.
Table 1. Summary statistics and comparisons of steps per day for each monitor and condition when participants attended cardiac rehabilitation (ACR) and a day when they did not attend (NCR).

<table>
<thead>
<tr>
<th>Monitor Condition</th>
<th>N</th>
<th>Steps per day Mean (SD)</th>
<th>% of SW steps Mean (SD)</th>
<th>MAPE (%)</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW ACR</td>
<td>37</td>
<td>5234 (1249)</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>NCR</td>
<td>35</td>
<td>3418 (2351)</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>M2 ACR</td>
<td>16</td>
<td>4328 (2502)</td>
<td>0.71 (0.26)</td>
<td>30.8</td>
<td>52.9</td>
</tr>
<tr>
<td>NCR</td>
<td>16</td>
<td>2050 (1235)</td>
<td>0.70 (0.25)</td>
<td>29.4</td>
<td>50.7</td>
</tr>
<tr>
<td>AGLFT ACR</td>
<td>16</td>
<td>7473 (1795)</td>
<td>1.64 (0.26)</td>
<td>34.1</td>
<td>52.7</td>
</tr>
<tr>
<td>NCR</td>
<td>16</td>
<td>9036 (4282)</td>
<td>1.64 (0.26)</td>
<td>34.1</td>
<td>52.7</td>
</tr>
<tr>
<td>AGM/W ACR</td>
<td>16</td>
<td>3669 (1118)</td>
<td>0.49 (0.30)</td>
<td>63.9</td>
<td>79.7</td>
</tr>
<tr>
<td>NCR</td>
<td>16</td>
<td>3128 (2724)</td>
<td>0.49 (0.30)</td>
<td>63.9</td>
<td>79.7</td>
</tr>
<tr>
<td>Apple ACR</td>
<td>16</td>
<td>4293 (1212)</td>
<td>0.52 (0.26)</td>
<td>31.7</td>
<td>37.4</td>
</tr>
<tr>
<td>NCR</td>
<td>16</td>
<td>4594 (2506)</td>
<td>0.51 (0.27)</td>
<td>31.6</td>
<td>37.5</td>
</tr>
<tr>
<td>Charge ACR</td>
<td>16</td>
<td>4602 (2565)</td>
<td>0.90 (0.26)</td>
<td>53.1</td>
<td>51.4</td>
</tr>
<tr>
<td>NCR</td>
<td>16</td>
<td>4610 (2528)</td>
<td>0.90 (0.26)</td>
<td>53.1</td>
<td>51.4</td>
</tr>
<tr>
<td>Zip ACR</td>
<td>16</td>
<td>3202 (1955)</td>
<td>0.65 (0.18)</td>
<td>34.2</td>
<td>31.9</td>
</tr>
<tr>
<td>NCR</td>
<td>16</td>
<td>3259 (2187)</td>
<td>0.65 (0.18)</td>
<td>34.2</td>
<td>31.9</td>
</tr>
</tbody>
</table>

*Significantly different from 100% of SW steps (p<0.05). **Significantly different between ACR and NCR condition (p<0.05).

3995 Board #312 May 30 8:00 AM - 9:30 AM Gait Improvements With BWSTT For Incomplete SCI One Year Post-Injury Becky Schooneenberg, Abigail Norman. Southwest Baptist University, Bolivar, MO.

(Please provide the abstract text here.)

3996 Board #313 May 30 8:00 AM - 9:30 AM Metabolic And Motor Proficiency Profiles Of Youth With Down Syndrome Vincenzo G. Nocera, Aaron P. Wood, Tyler J. Kybartas, Angela J. Wozencroft, Dawn P. Coe, FACSMM. University of Tennessee Knoxville, Knoxville, TN. Email: vnocera@vols.utk.edu

(Please provide the abstract text here.)

Two factors that have a significant impact on obesity levels are low resting metabolic rate (RMR) and insufficient physical activity (PA) levels. Impaired RMR and neuromuscular coordination are common in youth with Down syndrome (DS) and may contribute to high rates of obesity. The purpose of this study is to determine the metabolic and motor proficiency profiles of a sample of youth with DS. METHODS: Participants were youth with DS (n=11; 7 females, 16:83:3:9 y) attending a weeklong therapeutic recreation camp. Height and weight were measured, body mass index (BMI) was calculated, and BMI percentiles were used to determine weight status. The participants' RMR was evaluated in a supine position in a quiet, dark room for 15 minutes, using a portable metabolic system (Oxycon Mobile, Vyaire). One-minute averages were collected, and the first five minutes were excluded from the analysis. A rolling average technique was used to determine the average for each 5-min interval. The lowest rolling average was considered the RMR. The Brunninksm-Overestery test of Motor Proficiency Ed. 2 (BOT-2) Short Form was used to test motor proficiency. The BOT standard scores (range from 20 - 80) and age- and sex-specific percentiles were calculated for each participant using conversion tables in the BOT-2 administration manual. Spearman correlations were run to determine associations among BMI, RMR, and BOT-2 scores.

RESULTS: The average BMI of the participants was 29.7±1.7 kg/m² (91% obese). Average RMR was 4.1±1.8 ml/kg/min. The average standard BOT-2 score was 26.8±3.8, average percentile was 1.4±1.7. All youth were classified as 'Well below Average'. There were no significant correlations among the variables (p>0.05).

CONCLUSIONS: RMR does not appear to be impaired in this sample. However, in this sample, the extremely low motor proficiency scores may contribute to limited PA participation and obesity levels. PA programs and interventions should consider addressing strategies to improve motor proficiency in youth with DS.
Cancer survivors have unique physical and psychological challenges that can affect exercise adherence. While many factors play a role in regular exercise for cancer survivors, adherence may be improved by increased exercise self-efficacy (ESE), exercise support (ES), and exercise outcomes (EO).

PURPOSE: To determine the impact a community-based, individualized exercise intervention on exercise adherence, ESE, ES, and EO following the completion of a tailored exercise intervention.

METHODS: Six cancer survivors (mean age 60.2±11.5) were enrolled in a 12-week feasibility study. Baseline measures included the following tests: 1-rep max, treadmill, sit-and-reach and the ESE survey. Participants attended three, weekly, one-hour session led by a Cancer Exercise Specialist (CES). Training included cardiorespiratory, strength, and flexibility exercises tailored to the participant’s fitness and physical needs.

Measures were repeated immediately post-intervention (week 6) and at week 12. Exercise adherence was determined by the percentage of the 36 sessions completed. Paired t-tests were used to compare baseline and follow-up assessments.

RESULTS: Exercise adherence was 87.9%. Total ESE was not significantly higher at week 6 (41.8 ± 3.9 vs. 46 + 3.7, p<0.35) but demonstrated a statistically significant increase at week 12 (41.8 ± 3.9 vs. 43.8 ± 3.7, p<0.01). EO was not significantly higher at week 6 (18.8 ± 8.2 vs. 26.3 ± 7.5, p=0.35) but demonstrated a statistically significant increase at week 12 (18.8 ± 8.2 vs. 23.2 ± 12.3, p<0.03).

CONCLUSION: This study demonstrated feasibility of a community-based, CES-led 12-week exercise intervention. Improved ES and adherence were demonstrated among participants. Study outcomes are being used to guide an exercise intervention focused on adolescent and young adult survivors of cancer, a traditionally understudied group.

Breast cancer related lymphedema (BCRL) is a chronic swelling that may develop in breast, trunk and arm on the side of the surgery. More than one in five women with breast cancer develop BCRL. Recent studies in BCRL have demonstrated that resistance exercise can improve symptoms and quality of life without worsening the lymphedema. Few studies, however, have controlled for the use of a compression garment during or following exercise. Moreover, no studies have explored the potential of combining resistance exercise with therapeutic strategies to help reduce arm lymphedema volume. We hypothesize that a progressive resistance exercise program that incorporates compression therapy and follows the decongestive exercise sequence (DPRE) has the potential to reduce arm lymphedema volume. Purpose: To investigate the feasibility of a 12-week DPRE with compression therapy among women with BCRL.

METHODS: A randomised controlled pilot trial was conducted involving 20 women with stable BCRL, recruited through the Cross Cancer Institute in Edmonton, Canada. As per standard of care, all women were required to wear their day-time compression sleeve daily for 12 hours. Women were randomly assigned to one of three groups: (i) Standard care: home decongestive exercise regimen (n=6), (ii) DPRE plus use of a day-time compression wrap (AC) garment during exercise (n=7), and (iii) DPRE plus use of an adjustable compression wrap (AC) garment during exercise (n=7). Approval was obtained from the Health Research Ethics Board. Feasibility outcomes were analyzed descriptively. Due to the pilot nature of the study and the small sample size, no inferential analyses were performed. Results: Feasibility data demonstrate high study completion (95%), attendance (98%) and adherence to prescribed protocol of DPRE (97%). A mean reduction in arm lymphedema volume of 35 mls (-5.1%) was observed in the DPRE with day-time sleeve group and a 45 mls (-6.7%) in the DPRE with AC group. In contrast, a mean increase of 68 mls (+14.6%) was observed in the standard care group.

CONCLUSION: DPRE use with compression is feasible and shows promise in reducing lymphedema volume. A large-scale RCT is being conducted to examine the efficacy of this program on arm lymphedema volume, with the addition of imaging techniques to further inform changes to tissue composition.

PURPOSE: To assess the feasibility, safety, and preliminary efficacy of a supervised high-intensity interval training (HIIT) program in rectal cancer patients undergoing 5-weeks of neoadjuvant chemoradiotherapy (NACRT). METHODS: Thirty-six rectal cancer patients scheduled to receive NACRT followed by surgery were randomized to either exercise training (n=18) or usual care (n=18) in the Exercise During and After Rectal Cancer Treatment (EXERT) Trial in Edmonton, Alberta. Patients in the exercise group were asked to complete 3 supervised HIIT sessions/week for the duration of NACRT. Feasibility was determined by eligibility rate, recruitment rate, follow-up rate and exercise adherence. Safety was assessed by tracking serious adverse events related to exercise. The primary outcome was cardiorespiratory fitness (VO₂ peak) assessed immediately post-NACRT by a graded exercise test. Secondary efficacy outcomes included functional fitness assessed by the Senior’s Fitness Test.

RESULTS: From June 2017 to August 2019, 205 rectal cancer patients were screened, 131 (64%) were eligible, and 36 (27%) were recruited. Follow-up fitness testing post-NACRT was completed in 75% (exercise n=14; control n=13). Reasons for missed fitness testing were medical issues. Median attendance for the supervised HIIT sessions during NACRT was 82%. No serious adverse events were observed, however, 2 patients in the exercise group experienced musculoskeletal events which resulted in 4 missed exercise sessions. Analyses of covariation showed no statistically significant or clinically meaningful difference between groups for the primary outcome of VO₂ peak (adjusted between-group mean difference, 0.9 m/l/kg/min; 95% CI -1.6, 3.3; p=0.47). The 8-foot up-and-go was significantly better in the exercise group post-NACRT (adjusted between group mean difference, -0.4 seconds; 95% CI -0.7, 0.0; p=0.031).

CONCLUSIONS: Supervised HIIT during NACRT for rectal cancer was feasible and safe. Further research is needed, however, to better understand the feasibility of completing full training immediately following NACRT and whether HIIT can produce meaningful improvements in fitness in this challenging clinical setting.

Breast cancer related lymphedema (BCRL) is a chronic swelling that may develop in breast, trunk and arm on the side of the surgery. More than one in five women with breast cancer develop BCRL. Recent studies in BCRL have demonstrated that resistance exercise can improve symptoms and quality of life without worsening the lymphedema. Few studies, however, have controlled for the use of a compression garment during or following exercise. Moreover, no studies have explored the potential of combining resistance exercise with therapeutic strategies to help reduce arm lymphedema volume. We hypothesize that a progressive resistance exercise program that incorporates compression therapy and follows the decongestive exercise sequence (DPRE) has the potential to reduce arm lymphedema volume. Purpose: To investigate the feasibility of a 12-week DPRE with compression therapy among women with BCRL.

METHODS: A randomised controlled pilot trial was conducted involving 20 women with stable BCRL, recruited through the Cross Cancer Institute in Edmonton, Canada. As per standard of care, all women were required to wear their day-time compression sleeve daily for 12 hours. Women were randomly assigned to one of three groups: (i) Standard care: home decongestive exercise regimen (n=6), (ii) DPRE plus use of a day-time compression wrap (AC) garment during exercise (n=7), and (iii) DPRE plus use of an adjustable compression wrap (AC) garment during exercise (n=7). Approval was obtained from the Health Research Ethics Board. Feasibility outcomes were analyzed descriptively. Due to the pilot nature of the study and the small sample size, no inferential analyses were performed. Results: Feasibility data demonstrate high study completion (95%), attendance (98%) and adherence to prescribed protocol of DPRE (97%). A mean reduction in arm lymphedema volume of 35 mls (-5.1%) was observed in the DPRE with day-time sleeve group and a 45 mls (-6.7%) in the DPRE with AC group. In contrast, a mean increase of 68 mls (+14.6%) was observed in the standard care group.

CONCLUSION: DPRE use with compression is feasible and shows promise in reducing lymphedema volume. A large-scale RCT is being conducted to examine the efficacy of this program on arm lymphedema volume, with the addition of imaging techniques to further inform changes to tissue composition.
Multiple myeloma (MM) is associated with fracture risk and deconditioning. Exercise training can attenuate functional declines, but the safety of exercise in this population remains unclear. PURPOSE: This case series explores the clinical history, considerations for triage, program adaptations, and functional changes in patients with MM taking part in the Alberta Cancer Exercise (ACE) study.

METHODS: An exercise physiologist reviewed cases using a cancer-specific intake and the PAR-Q+. Due to MM diagnosis, physician approval was required for entry into the ACE study. ACE involved 60 minutes of community or clinic-based exercise 2x/wk for 12 weeks. Pre/post measures included the 6-Minute Walk Test (6MWT), 30s sit-to-stand, sit and reach, and optional max bench press (1RM) and plank tests.

RESULTS: CASE 1: 54-year old male on chemotherapy with a history of lytic lesions throughout the thoracic cage and pelvis, and radiation therapy (RT) to large areas of his body. He had undergone surgery and was recovering from a cell transplantation (SCT). Goal: improve fitness, and instrumentation C5-T3, and prior RT to spine and pelvis. Approved for clinic-based exercise with low intensity exercise due to fracture risk and pain. No adverse events occurred and the time to AT in these men undergoing prostate cancer therapy.

Funding: This study is fully supported by the Division of Intramural Research of the National Institute of Nursing Research and the Clinical Center, Rehabilitation Medicine Department of the National Institutes of Health, Bethesda, Maryland.

CONCLUSIONS: While the construct of fatigue is complex and multidimensional, AT provides an objective measure of endurance that is not influenced by perception or motivation. The National Comprehensive Cancer Network (NCCN) recommends moderate exercise programs during and after completion of cancer treatment to reduce cancer-related fatigue. In this study, vigorous exercise training performed during EBRRT, maintained cardiorespiratory fitness and increased the time to AT in these men undergoing prostate cancer therapy.

Epidemiological data shows that regular physical activity is associated with reduced risk of developing the blood cancer Myeloma. Myeloma is preceded by the asymptomatic stages Monoclonal Gammapathy of Undetermined Significance (MGUS) and Smouldering Myeloma (SM). International guidelines do not advocate treatment for MGUS and SM, instead disease biomarkers are routinely monitored. The effect of exercise training on MGUS and SM disease activity has not yet been investigated despite evidence that an active lifestyle may reduce Myeloma risk.

PURPOSE: Determine the feasibility of a progressive exercise programme for MGUS and SM patients, for subsequent investigation of its effect on disease activity. METHODS: 62 patients (21 MGUS, 41 SM) were invited to participate in a single-arm trial. The exercise programme comprised 2 supervised and 1 home-based session per week for 16 weeks. Supervised exercise involved treadmill walking (30 mins progressing from 40% to 80% VO2MAX) at home participants completed a moderate intensity walk for ≥40 mins. Results are mean ± SD. RESULTS: Uptake was 31% and retention was 79%. Ten participants (2 MGUS, 8 SM, 50% male, 60 ± 11 years) have completed the trial to date. Adherence was higher for supervised (91 ± 7%) than home-based (74 ± 26%) sessions. In supervised sessions, compliance to duration was high (98 ± 3%) but compliance to intensity was low (61 ± 20%) due to a drop-off at intensities >70% VO2MAX (<70% = 70 ± 30%; >70% = 52 ± 28%). The 40-min home-based walk target was exceeded (47 ± 11 mins). No severe adverse events occurred. CONCLUSION: Exercise is safe for patients with MGUS and SM. Adherence to supervised exercise was high, as was compliance to 30 mins of walking at 40-70% VO2MAX. Walking exercise >70% VO2MAX was not feasible. Future studies could evaluate interval training to maximise exercise intensity with the aim of delaying disease progression from MGUS and SM to Myeloma.

Grants: Physiological Society & University of Bath Alumni Fund
Following radical prostatectomy, patients are generally advised to engage in no strenuous exercise for 4-6 weeks. Beyond that time range, the rapidity with which a patient may return to high-level aerobic activity is not known.

**PURPOSE:** To examine the recovery following radical prostatectomy (RP) of an endurance-trained 65-year old man with localized prostate cancer and single-vessel heart disease.

**METHODS:** A maximal incremental exercise test and a one-hour steady-state test were performed just prior to and three months following robotic RP to determine maximal oxygen consumption ($VO_{2max}$) and other cardiorespiratory variables. The patient recorded his training as he prepared for an endurance event that was to occur three months after RP, the Norwegian Foot March (NFM), a 30-km road march carrying 11.4 kg.

**RESULTS:** In the month prior to RP, the patient performed 2-3 hours of vigorous-intensity aerobic exercise per week, fast walking carrying an 11.4-kg pack, with the longest individual session being a 16-km road march. Just prior to surgery, $VO_{2max}$ was 36.7 mL.min⁻¹.kg⁻¹, heart rate during 30 min at 72 km.hr⁻¹ and 0% grade was 77% of heart rate reserve (HRR), and during 30 min at 5.3 km.hr⁻¹ and 10% grade was 92% HRR. On post-surgery day 44, he did a 19-km road march carrying 11.4 kg, exceeding the training level of the month pre-surgery. Three months post-surgery, $VO_{2max}$ was 42.7 mL.min⁻¹.kg⁻¹, and heart rates during the flat and uphill 30-min sessions at the same absolute-intensity as pre-surgery were 70% and 83% HRR, respectively. He completed the NFM 93 days post-surgery in 4:24:37, with an average heart rate of 72% HRR.

**CONCLUSIONS:** This case study demonstrates that an aerobically trained prostate cancer patient can return to high-level aerobic training in as little as seven weeks post-radical prostatectomy, and even exceed pre-surgery fitness. This finding has implications for prognosis given the beneficial effect of vigorous-intensity exercise on prostate cancer progression.
Research indicates black women experience 50% less weight loss through behavioral counseling programs when compared to white women. Examining context may reveal factors associated with weight loss differences. Ecological Momentary Assessment (EMA) via digital devices enables data collection from participants as they move through their daily routine. In this project, we asked participants to respond to prompts about their eating, physical activity and social copresence up to eight times per day over a 30-day period.

**PURPOSE:** To identify characteristics associated with EMA response rates.

**METHODS:** Eligible participants were female, aged 35-64 years, self-identified Non-Hispanic black or white race, and were eligible for a Federally Qualified Health Center-based weight loss program based on having a BMI ≥ 30. Survey measures were RA-administered and included household income, work hours, years of education, health literacy and numeracy, food security, depression, anxiety, and social relationships. The RA measured and recorded participant height and weight. The RA then installed and configured the EMA system for data collection on a study-provided smartphone or on the participant’s smartphone if it was compatible with the system. The EMA survey asked: “Where are you?” “With anyone?” “Eat or drink in the last 15 minutes?” “Walk or move in the last 15 minutes?” Responses were automatically submitted to the study’s secure server.

**RESULTS:** Of the 259 participants, 136 (52.5%) were classified as responders (>50% response rate). A significantly greater percentage of responders owned a smartphone, 60.3% vs 35.8%, p < 0.001 and lived alone or with one other person 62% vs 49%, p = 0.036. Marginally non-significant positive associations with response included an eating disorder, 21.3% vs 12.2%, p = 0.05; seeing fewer people weekly, 4 vs 5, p = 0.06; not having a TV in the kitchen, 91.8% vs 84.6%, p = 0.07; and food insecurity, 30.9% vs 19.5%, p = 0.09.

**CONCLUSIONS:** EMA helps examine context if the research participant regularly responds. Identifying factors associated with high response rates is useful in improving EMA research. Future research with EMA in vulnerable populations may require more extensive participant training/practice using study phones or integration of EMA into participants’ existing tools.

**References**

1. Usui, A.; **Meters in 6 minutes; *** Repeats per minute; **** kg; *****Degrees
2. Research indicates black women experience 50% less weight loss through behavioral counseling programs when compared to white women. Examining context may reveal factors associated with weight loss differences. Ecological Momentary Assessment (EMA) via digital devices enables data collection from participants as they move through their daily routine. In this project, we asked participants to respond to prompts about their eating, physical activity and social copresence up to eight times per day over a 30-day period.

**CONCLUSIONS:** It is believed that ONCOFITNESS can fill a gap in physical activity issues for cancer patients with a view to health promotion, protection and recovery, and care delivery, ensuring a comprehensive approach to the health-disease process with an emphasis on primary care.

| G-47 | Free Communication/Poster - Health Equity - Socio-Economic Status | Saturday, May 30, 2020, 8:00 AM - 10:30 AM | Room: CC-Exhibit Hall |
| 4011 | Board #328 | May 30 8:00 AM - 9:30 AM | One (1) Month Contextual Comparisons Between Obese Black And White Women To Inform Weight Loss Interventions |
| 4012 | Board #329 | May 30 8:00 AM - 9:30 AM | Factors Associated With High Response Rates To Improve Ecological Momentary Assessment Research |
| 4013 | Board #330 | May 30 8:00 AM - 9:30 AM | Influence Of Socioeconomic Status On Cardiometabolic Risk Factor Responses In Active Older Adults |

Socioeconomic status (SES) has been reported to influence cardiovascular disease (CVD) and health in adult populations. This study was designed to determine if older adults from communities with different SES would differ on cardiometabolic risks (CMO) initially and following a three-month period where they were encouraged to be physically active.

**METHODS:** The study is part of a larger project as older participants volunteered to take part in the study and they signed an institutional approved informed consent form prior to participation. The mean age of the participants ranged from 72.0 to 74.3 years. The average community income of the participants were $50,537 (site 2), $68,673 (site 1) and $78,894 (site 3). Some of the participants were involved in structured, some in unstructured and some in little or no physical activity. CMO risks measured included cholesterol, HDL, LDL, triglyceride, blood glucose, SBP and DBP on the initial assessment and three months later. Additionally, they were measured for BMI, BP% and timed up and go.

**RESULTS:** SBP was a risk factor (>135 mmHg) for every assessment, except for test 2 at site 1. Blood glucose suggest on test 2 that participants at site 2 and site 3 were diabetic (GLU ≥ 125 mg/dL). However, the participants had not fast and their HbA1c values were below 6.4 mmol/mol. Cholesterol on test 1 (235 mg/dL) indicate a risk for individuals from site 1. Generally, the blood profiles were not statistically different and most were not risk factors.

Socioeconomic status (SES) has been reported to influence cardiovascular disease (CVD) and health in adult populations. **Purpose:** This study was designed to determine if older adults from communities with different SES would differ on cardiometabolic risks (CMO) initially and following a three-month period where they were encouraged to be physically active.

**Methods:** The study is part of a larger project as older participants volunteered to take part in the study and they signed an institutional approved informed consent form prior to participation. The mean age of the participants ranged from 72.0 to 74.3 years. The average community income of the participants were $50,537 (site 2), $68,673 (site 1) and $78,894 (site 3). Some of the participants were involved in structured, some in unstructured and some in little or no physical activity. CMO risks measured included cholesterol, HDL, LDL, triglyceride, blood glucose, SBP and DBP on the initial assessment and three months later. Additionally, they were measured for BMI, BP% and timed up and go.

**Results:** SBP was a risk factor (>135 mmHg) for every assessment, except for test 2 at site 1. Blood glucose suggest on test 2 that participants at site 2 and site 3 were diabetic (GLU ≥ 125 mg/dL). However, the participants had not fast and their HbA1c values were below 6.4 mmol/mol. Cholesterol on test 1 (235 mg/dL) indicate a risk for individuals from site 1. Generally, the blood profiles were not statistically different and most were not risk factors.

**Conclusions:** The study is part of a larger project as older participants volunteered to take part in the study and they signed an institutional approved informed consent form prior to participation. The mean age of the participants ranged from 72.0 to 74.3 years. The average community income of the participants were $50,537 (site 2), $68,673 (site 1) and $78,894 (site 3). Some of the participants were involved in structured, some in unstructured and some in little or no physical activity. CMO risks measured included cholesterol, HDL, LDL, triglyceride, blood glucose, SBP and DBP on the initial assessment and three months later. Additionally, they were measured for BMI, BP% and timed up and go.

**Results:** SBP was a risk factor (>135 mmHg) for every assessment, except for test 2 at site 1. Blood glucose suggest on test 2 that participants at site 2 and site 3 were diabetic (GLU ≥ 125 mg/dL). However, the participants had not fast and their HbA1c values were below 6.4 mmol/mol. Cholesterol on test 1 (235 mg/dL) indicate a risk for individuals from site 1. Generally, the blood profiles were not statistically different and most were not risk factors.

**Conclusions:** The study is part of a larger project as older participants volunteered to take part in the study and they signed an institutional approved informed consent form prior to participation. The mean age of the participants ranged from 72.0 to 74.3 years. The average community income of the participants were $50,537 (site 2), $68,673 (site 1) and $78,894 (site 3). Some of the participants were involved in structured, some in unstructured and some in little or no physical activity. CMO risks measured included cholesterol, HDL, LDL, triglyceride, blood glucose, SBP and DBP on the initial assessment and three months later. Additionally, they were measured for BMI, BP% and timed up and go.

**Results:** SBP was a risk factor (>135 mmHg) for every assessment, except for test 2 at site 1. Blood glucose suggest on test 2 that participants at site 2 and site 3 were diabetic (GLU ≥ 125 mg/dL). However, the participants had not fast and their HbA1c values were below 6.4 mmol/mol. Cholesterol on test 1 (235 mg/dL) indicate a risk for individuals from site 1. Generally, the blood profiles were not statistically different and most were not risk factors.

**Conclusions:** The study is part of a larger project as older participants volunteered to take part in the study and they signed an institutional approved informed consent form prior to participation. The mean age of the participants ranged from 72.0 to 74.3 years. The average community income of the participants were $50,537 (site 2), $68,673 (site 1) and $78,894 (site 3). Some of the participants were involved in structured, some in unstructured and some in little or no physical activity. CMO risks measured included cholesterol, HDL, LDL, triglyceride, blood glucose, SBP and DBP on the initial assessment and three months later. Additionally, they were measured for BMI, BP% and timed up and go.

**Results:** SBP was a risk factor (>135 mmHg) for every assessment, except for test 2 at site 1. Blood glucose suggest on test 2 that participants at site 2 and site 3 were diabetic (GLU ≥ 125 mg/dL). However, the participants had not fast and their HbA1c values were below 6.4 mmol/mol. Cholesterol on test 1 (235 mg/dL) indicate a risk for individuals from site 1. Generally, the blood profiles were not statistically different and most were not risk factors.

**Conclusions:** The study is part of a larger project as older participants volunteered to take part in the study and they signed an institutional approved informed consent form prior to participation. The mean age of the participants ranged from 72.0 to 74.3 years. The average community income of the participants were $50,537 (site 2), $68,673 (site 1) and $78,894 (site 3). Some of the participants were involved in structured, some in unstructured and some in little or no physical activity. CMO risks measured included cholesterol, HDL, LDL, triglyceride, blood glucose, SBP and DBP on the initial assessment and three months later. Additionally, they were measured for BMI, BP% and timed up and go.

**Results:** SBP was a risk factor (>135 mmHg) for every assessment, except for test 2 at site 1. Blood glucose suggest on test 2 that participants at site 2 and site 3 were diabetic (GLU ≥ 125 mg/dL). However, the participants had not fast and their HbA1c values were below 6.4 mmol/mol. Cholesterol on test 1 (235 mg/dL) indicate a risk for individuals from site 1. Generally, the blood profiles were not statistically different and most were not risk factors.
CONCLUSIONS: These data indicate that in diverse populations with different SES, CMO risks are essentially the same. This allows for the possibility that healthy lifestyle choices may be a critical element contributing to the development of CVD.